

# JMAP

# REGENTS AT RANDOM

NY Algebra II Regents Exam Questions  
from Spring 2015 to August 2018 Sorted at Random

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### Algebra II Regents at Random

- 1 A fast-food restaurant analyzes data to better serve its customers. After its analysis, it discovers that the events  $D$ , that a customer uses the drive-thru, and  $F$ , that a customer orders French fries, are independent. The following data are given in a report:

$$P(F) = 0.8$$

$$P(F \cap D) = 0.456$$

Given this information,  $P(F|D)$  is

- 1) 0.344
  - 2) 0.3648
  - 3) 0.57
  - 4) 0.8
- 2 Which value is *not* contained in the solution of the system shown below?

$$a + 5b - c = -20$$

$$4a - 5b + 4c = 19$$

$$-a - 5b - 5c = 2$$

- 1) -2
  - 2) 2
  - 3) 3
  - 4) -3
- 3 Which expression is equivalent to  $\frac{2x^4 + 8x^3 - 25x^2 - 6x + 14}{x + 6}$ ?

- 1)  $2x^3 + 4x^2 + x - 12 + \frac{86}{x + 6}$
- 2)  $2x^3 - 4x^2 - x + 14$
- 3)  $2x^3 - 4x^2 - x + \frac{14}{x + 6}$
- 4)  $2x^3 - 4x^2 - x$

- 4 The scores of a recent test taken by 1200 students had an approximately normal distribution with a mean of 225 and a standard deviation of 18. Determine the number of students who scored between 200 and 245.

- 5 The inverse of the function  $f(x) = \frac{x+1}{x-2}$  is

- 1)  $f^{-1}(x) = \frac{x+1}{x+2}$
- 2)  $f^{-1}(x) = \frac{2x+1}{x-1}$
- 3)  $f^{-1}(x) = \frac{x+1}{x-2}$
- 4)  $f^{-1}(x) = \frac{x-1}{x+1}$

- 6 Algebraically determine whether the function  $j(x) = x^4 - 3x^2 - 4$  is odd, even, or neither.

- 7 The roots of the equation  $x^2 + 2x + 5 = 0$  are

- 1) -3 and 1
- 2) -1, only
- 3)  $-1 + 2i$  and  $-1 - 2i$
- 4)  $-1 + 4i$  and  $-1 - 4i$

- 8 While experimenting with her calculator, Candy creates the sequence 4, 9, 19, 39, 79, .... Write a recursive formula for Candy's sequence. Determine the eighth term in Candy's sequence.

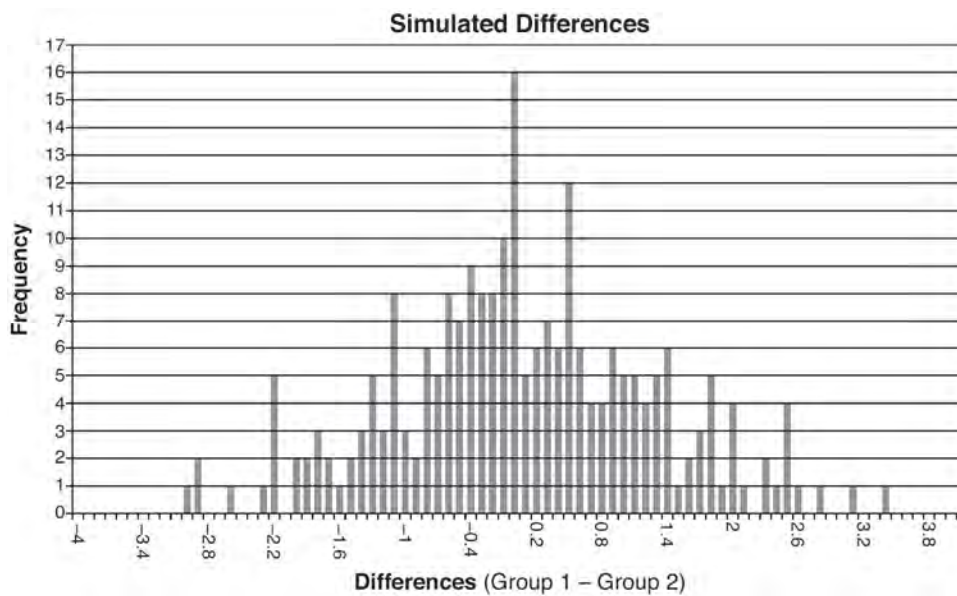
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- 9 Ayva designed an experiment to determine the effect of a new energy drink on a group of 20 volunteer students. Ten students were randomly selected to form group 1 while the remaining 10 made up group 2. Each student in group 1 drank one energy drink, and each student in group 2 drank one cola drink. Ten minutes later, their times were recorded for reading the same paragraph of a novel. The results of the experiment are shown below.

Group 1 (seconds)	Group 2 (seconds)
17.4	23.3
18.1	18.8
18.2	22.1
19.6	12.7
18.6	16.9
16.2	24.4
16.1	21.2
15.3	21.2
17.8	16.3
19.7	14.5
Mean = 17.7	Mean = 19.1

Ayva thinks drinking energy drinks makes students read faster. Using information from the experimental design or the results, explain why Ayva’s hypothesis may be *incorrect*. Using the given results, Ayva randomly mixes the 20 reading times, splits them into two groups of 10, and simulates the difference of the means 232 times.



Ayva has decided that the difference in mean reading times is not an unusual occurrence. Support her decision using the results of the simulation. Explain your reasoning.

- 10 Solve the following system of equations algebraically.  $x^2 + y^2 = 400$

$$y = x - 28$$

- 11 The expression  $\frac{x^3 + 2x^2 + x + 6}{x + 2}$  is equivalent to

- 1)  $x^2 + 3$
- 2)  $x^2 + 1 + \frac{4}{x + 2}$
- 3)  $2x^2 + x + 6$
- 4)  $2x^2 + 1 + \frac{4}{x + 2}$

- 12 Which function's graph has a period of 8 and reaches a maximum height of 1 if at least one full period is graphed?

- 1)  $y = -4 \cos\left(\frac{\pi}{4}x\right) - 3$
- 2)  $y = -4 \cos\left(\frac{\pi}{4}x\right) + 5$
- 3)  $y = -4 \cos(8x) - 3$
- 4)  $y = -4 \cos(8x) + 5$

- 13 A ball is dropped from a height of 32 feet. It bounces and rebounds 80% of the height from which it was falling. What is the total downward distance, in feet, the ball traveled up to the 12th bounce?

- 1) 29
- 2) 58
- 3) 120
- 4) 149

- 14 The Rickerts decided to set up an account for their daughter to pay for her college education. The day their daughter was born, they deposited \$1000 in an account that pays 1.8% compounded annually. Beginning with her first birthday, they deposit an additional \$750 into the account on each of her birthdays. Which expression correctly represents the amount of money in the account  $n$  years after their daughter was born?

- 1)  $a_n = 1000(1.018)^n + 750$
- 2)  $a_n = 1000(1.018)^n + 750n$
- 3)  $a_0 = 1000$   
 $a_n = a_{n-1}(1.018) + 750$
- 4)  $a_0 = 1000$   
 $a_n = a_{n-1}(1.018) + 750n$

- 15 The completely factored form of  $2d^4 + 6d^3 - 18d^2 - 54d$  is

- 1)  $2d(d^2 - 9)(d + 3)$
- 2)  $2d(d^2 + 9)(d + 3)$
- 3)  $2d(d + 3)^2(d - 3)$
- 4)  $2d(d - 3)^2(d + 3)$

- 16 Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book. Suppose the total amount Simon owes when the book is  $n$  days late can be determined by an arithmetic sequence. Determine a formula for  $a_n$ , the  $n$ th term of this sequence. Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

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17 The distribution of the diameters of ball bearings made under a given manufacturing process is normally distributed with a mean of 4 cm and a standard deviation of 0.2 cm. What proportion of the ball bearings will have a diameter less than 3.7 cm?

- 1) 0.0668
- 2) 0.4332
- 3) 0.8664
- 4) 0.9500

18 One of the medical uses of Iodine-131 (I-131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I-131 is approximately 8.02 days. A patient is injected with 20 milligrams of I-131. Determine, to the *nearest day*, the amount of time needed before the amount of I-131 in the patient's body is approximately 7 milligrams.

19 For  $x > 0$ , which expression is equivalent to

$$\frac{\sqrt[3]{x^2} \cdot \sqrt{x^5}}{\sqrt[6]{x}}?$$

- 1)  $x$
- 2)  $x^{\frac{3}{2}}$
- 3)  $x^3$
- 4)  $x^{10}$

20 Explain how  $\left(3^{\frac{1}{5}}\right)^2$  can be written as the equivalent radical expression  $\sqrt[5]{9}$ .

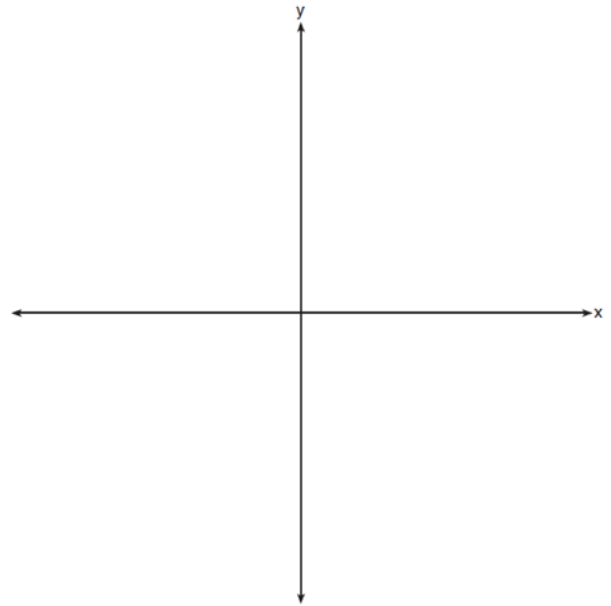
21 Determine, to the *nearest tenth of a year*, how long it would take an investment to double at a  $3\frac{3}{4}\%$  interest rate, compounded continuously.

22 The solution set for the equation

$$\sqrt{x+14} - \sqrt{2x+5} = 1$$

- 1)  $\{-6\}$
- 2)  $\{2\}$
- 3)  $\{18\}$
- 4)  $\{2, 22\}$

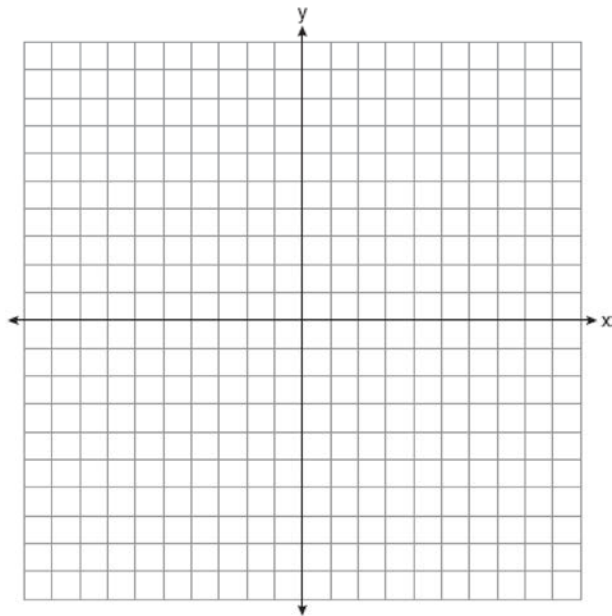
23 a) On the axes below, sketch *at least one* cycle of a sine curve with an amplitude of 2, a midline at  $y = -\frac{3}{2}$ , and a period of  $2\pi$ .



b) Explain any differences between a sketch of  $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$  and the sketch from part a.

- 24 Find algebraically the zeros for

$p(x) = x^3 + x^2 - 4x - 4$ . On the set of axes below, graph  $y = p(x)$ .



- 25 The lifespan of a 60-watt lightbulb produced by a company is normally distributed with a mean of 1450 hours and a standard deviation of 8.5 hours. If a 60-watt lightbulb produced by this company is selected at random, what is the probability that its lifespan will be between 1440 and 1465 hours?
- 1) 0.3803
  - 2) 0.4612
  - 3) 0.8415
  - 4) 0.9612

- 26 For the function  $f(x) = (x - 3)^3 + 1$ , find  $f^{-1}(x)$ .

- 27 What is the completely factored form of

$$k^4 - 4k^2 + 8k^3 - 32k + 12k^2 - 48?$$

- 1)  $(k - 2)(k - 2)(k + 3)(k + 4)$
- 2)  $(k - 2)(k - 2)(k + 6)(k + 2)$
- 3)  $(k + 2)(k - 2)(k + 3)(k + 4)$
- 4)  $(k + 2)(k - 2)(k + 6)(k + 2)$

- 28 Iridium-192 is an isotope of iridium and has a half-life of 73.83 days. If a laboratory experiment begins with 100 grams of Iridium-192, the number of grams,  $A$ , of Iridium-192 present after  $t$  days

would be  $A = 100\left(\frac{1}{2}\right)^{\frac{t}{73.83}}$ . Which equation

approximates the amount of Iridium-192 present after  $t$  days?

- 1)  $A = 100\left(\frac{73.83}{2}\right)^t$
- 2)  $A = 100\left(\frac{1}{147.66}\right)^t$
- 3)  $A = 100(0.990656)^t$
- 4)  $A = 100(0.116381)^t$

- 29 If  $f(x) = x^2 + 9$  and  $g(x) = x + 3$ , which operation would not result in a polynomial expression?

- 1)  $f(x) + g(x)$
- 2)  $f(x) - g(x)$
- 3)  $f(x) \cdot g(x)$
- 4)  $f(x) \div g(x)$

- 30 Algebraically prove that the difference of the squares of any two consecutive integers is an odd integer.

- 31 The results of a poll of 200 students are shown in the table below:

	Preferred Music Style		
	Techno	Rap	Country
Female	54	25	27
Male	36	40	18

For this group of students, do these data suggest that gender and preferred music styles are independent of each other? Justify your answer.

- 32 Jake wants to buy a car and hopes to save at least \$5000 for a down payment. The table below summarizes the amount of money he plans to save each week.

Week	1	2	3	4	5
Money Saved, in Dollars	2	5	12.5	31.25	...

Based on this plan, which expression should he use to determine how much he has saved in  $n$  weeks?

- 1)  $\frac{2 - 2(2.5^n)}{1 - 2.5}$                       3)  $\frac{1 - 2.5^n}{1 - 2.5}$   
 2)  $\frac{2 - 2(2.5^{n-1})}{1 - 2.5}$                       4)  $\frac{1 - 2.5^{n-1}}{1 - 2.5}$

- 33 If the terminal side of angle  $\theta$ , in standard position, passes through point  $(-4, 3)$ , what is the numerical value of  $\sin \theta$ ?

- 1)  $\frac{3}{5}$   
 2)  $\frac{4}{5}$   
 3)  $-\frac{3}{5}$   
 4)  $-\frac{4}{5}$

- 34 The solution of  $87e^{0.3x} = 5918$ , to the *nearest thousandth*, is

- 1) 0.583  
 2) 1.945  
 3) 4.220  
 4) 14.066

- 35 A study was designed to test the effectiveness of a new drug. Half of the volunteers received the drug. The other half received a sugar pill. The probability of a volunteer receiving the drug and getting well was 40%. What is the probability of a volunteer getting well, given that the volunteer received the drug?

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- 36 The distance needed to stop a car after applying the brakes varies directly with the square of the car's speed. The table below shows stopping distances for various speeds.

<b>Speed (mph)</b>	10	20	30	40	50	60	70
<b>Distance (ft)</b>	6.25	25	56.25	100	156.25	225	306.25

Determine the average rate of change in braking distance, in ft/mph, between one car traveling at 50 mph and one traveling at 70 mph. Explain what this rate of change means as it relates to braking distance.

- 37 To the *nearest tenth*, the value of  $x$  that satisfies  $2^x = -2x + 11$  is
- 1) 2.5
  - 2) 2.6
  - 3) 5.8
  - 4) 5.9
- 38 The world population was 2560 million people in 1950 and 3040 million in 1960 and can be modeled by the function  $p(t) = 2560e^{0.017185t}$ , where  $t$  is time in years after 1950 and  $p(t)$  is the population in millions. Determine the average rate of change of  $p(t)$  in millions of people per year, from  $4 \leq t \leq 8$ . Round your answer to the *nearest hundredth*.
- 39 Which equation represents a parabola with a focus of  $(0,4)$  and a directrix of  $y = 2$ ?
- 1)  $y = x^2 + 3$
  - 2)  $y = -x^2 + 1$
  - 3)  $y = \frac{x^2}{2} + 3$
  - 4)  $y = \frac{x^2}{4} + 3$
- 40 In contract negotiations between a local government agency and its workers, it is estimated that there is a 50% chance that an agreement will be reached on the salaries of the workers. It is estimated that there is a 70% chance that there will be an agreement on the insurance benefits. There is a 20% chance that no agreement will be reached on either issue. Find the probability that an agreement will be reached on *both* issues. Based on this answer, determine whether the agreement on salaries and the agreement on insurance are independent events. Justify your answer.
- 41 The value of a new car depreciates over time. Greg purchased a new car in June 2011. The value,  $V$ , of his car after  $t$  years can be modeled by the equation  $\log_{0.8} \left( \frac{V}{17000} \right) = t$ . What is the average decreasing rate of change per year of the value of the car from June 2012 to June 2014, to the *nearest ten dollars per year*?
- 1) 1960
  - 2) 2180
  - 3) 2450
  - 4) 2770



- 42 Monthly mortgage payments can be found using the formula below:

$$M = \frac{P\left(\frac{r}{12}\right)\left(1 + \frac{r}{12}\right)^n}{\left(1 + \frac{r}{12}\right)^n - 1}$$

$M$  = monthly payment  
 $P$  = amount borrowed  
 $r$  = annual interest rate  
 $n$  = number of monthly payments

The Banks family would like to borrow \$120,000 to purchase a home. They qualified for an annual interest rate of 4.8%. Algebraically determine the *fewest* number of whole years the Banks family would need to include in the mortgage agreement in order to have a monthly payment of no more than \$720.

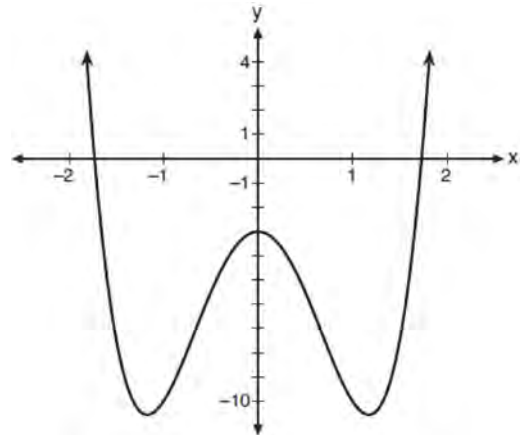
- 43 Which equation has  $1 - i$  as a solution?

- 1)  $x^2 + 2x - 2 = 0$
- 2)  $x^2 + 2x + 2 = 0$
- 3)  $x^2 - 2x - 2 = 0$
- 4)  $x^2 - 2x + 2 = 0$

- 44 In New York State, the minimum wage has grown exponentially. In 1966, the minimum wage was \$1.25 an hour and in 2015, it was \$8.75. Algebraically determine the rate of growth to the *nearest percent*.

- 45 Use an appropriate procedure to show that  $x - 4$  is a factor of the function  $f(x) = 2x^3 - 5x^2 - 11x - 4$ . Explain your answer.

- 46 Consider the function  $p(x) = 3x^3 + x^2 - 5x$  and the graph of  $y = m(x)$  below.



Which statement is true?

- 1)  $p(x)$  has three real roots and  $m(x)$  has two real roots.
  - 2)  $p(x)$  has one real root and  $m(x)$  has two real roots.
  - 3)  $p(x)$  has two real roots and  $m(x)$  has three real roots.
  - 4)  $p(x)$  has three real roots and  $m(x)$  has four real roots.
- 47 Explain how  $(-8)^{\frac{4}{3}}$  can be evaluated using properties of rational exponents to result in an integer answer.

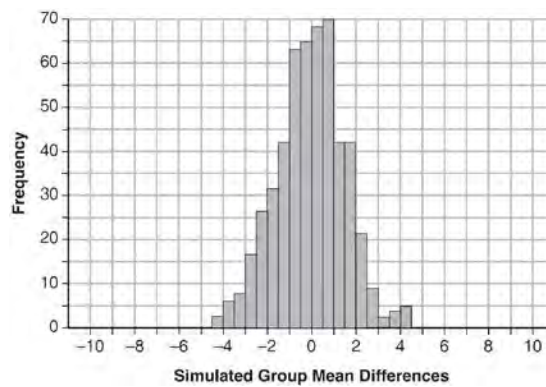
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- 48 Seventy-two students are randomly divided into two equally-sized study groups. Each member of the first group (group 1) is to meet with a tutor after school twice each week for one hour. The second group (group 2), is given an online subscription to a tutorial account that they can access for a maximum of two hours each week. Students in both groups are given the same tests during the year. A summary of the two groups' final grades is shown below:

	Group 1	Group 2
$\bar{x}$	80.16	83.8
$S_x$	6.9	5.2

Calculate the mean difference in the final grades (group 1 – group 2) and explain its meaning in the context of the problem. A simulation was conducted in which the students' final grades were rerandomized 500 times. The results are shown below.



Use the simulation to determine if there is a significant difference in the final grades. Explain your answer.

- 49 The average depreciation rate of a new boat is approximately 8% per year. If a new boat is purchased at a price of \$75,000, which model is a recursive formula representing the value of the boat  $n$  years after it was purchased?
- 1)  $a_n = 75,000(0.08)^n$
  - 2)  $a_0 = 75,000$   
 $a_n = (0.92)^n$
  - 3)  $a_n = 75,000(1.08)^n$
  - 4)  $a_0 = 75,000$   
 $a_n = 0.92(a_{n-1})$
- 50 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option A will pay him 4.5% interest compounded annually. Option B will pay him 4.6% compounded quarterly. Write a function of option A and option B that calculates the value of each account after  $n$  years. Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option B will earn than option A to the nearest cent. Algebraically determine, to the nearest tenth of a year, how long it would take for option B to double Seth's initial investment.

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51 Given  $\cos \theta = \frac{7}{25}$ , where  $\theta$  is an angle in standard position terminating in quadrant IV, and  $\sin^2 \theta + \cos^2 \theta = 1$ , what is the value of  $\tan \theta$ ?

- 1)  $-\frac{24}{25}$
- 2)  $-\frac{24}{7}$
- 3)  $\frac{24}{25}$
- 4)  $\frac{24}{7}$

52 Which equation represents a parabola with the focus at  $(0, -1)$  and the directrix of  $y = 1$ ?

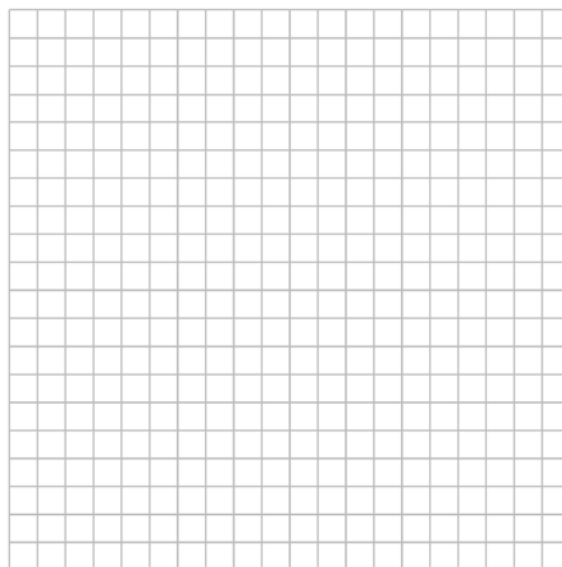
- 1)  $x^2 = -8y$
- 2)  $x^2 = -4y$
- 3)  $x^2 = 8y$
- 4)  $x^2 = 4y$

53 The sequence  $a_1 = 6$ ,  $a_n = 3a_{n-1}$  can also be written as

- 1)  $a_n = 6 \cdot 3^n$
- 2)  $a_n = 6 \cdot 3^{n+1}$
- 3)  $a_n = 2 \cdot 3^n$
- 4)  $a_n = 2 \cdot 3^{n+1}$

54 Using the identity  $\sin^2 \theta + \cos^2 \theta = 1$ , find the value of  $\tan \theta$ , to the *nearest hundredth*, if  $\cos \theta$  is  $-0.7$  and  $\theta$  is in Quadrant II.

55 The ocean tides near Carter Beach follow a repeating pattern over time, with the amount of time between each low and high tide remaining relatively constant. On a certain day, low tide occurred at 8:30 a.m. and high tide occurred at 3:00 p.m. At high tide, the water level was 12 inches above the average local sea level; at low tide it was 12 inches below the average local sea level. Assume that high tide and low tide are the maximum and minimum water levels each day, respectively. Write a cosine function of the form  $f(t) = A \cos(Bt)$ , where  $A$  and  $B$  are real numbers, that models the water level,  $f(t)$ , in inches above or below the average Carter Beach sea level, as a function of the time measured in  $t$  hours since 8:30 a.m. On the grid below, graph one cycle of this function.



People who fish in Carter Beach know that a certain species of fish is most plentiful when the water level is increasing. Explain whether you would recommend fishing for this species at 7:30 p.m. or 10:30 p.m. using evidence from the given context.

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56 A recursive formula for the sequence 18, 9, 4.5, ... is

1)  $g_1 = 18$

$$g_n = \frac{1}{2}g_{n-1}$$

2)  $g_n = 18\left(\frac{1}{2}\right)^{n-1}$

3)  $g_1 = 18$

$$g_n = 2g_{n-1}$$

4)  $g_n = 18(2)^{n-1}$

57 Kristin wants to increase her running endurance. According to experts, a gradual mileage increase of 10% per week can reduce the risk of injury. If Kristin runs 8 miles in week one, which expression can help her find the total number of miles she will have run over the course of her 6-week training program?

1)  $\sum_{n=1}^6 8(1.10)^{n-1}$

2)  $\sum_{n=1}^6 8(1.10)^n$

3)  $\frac{8 - 8(1.10)^6}{0.90}$

4)  $\frac{8 - 8(0.10)^n}{1.10}$

58 Rewrite the expression

$(4x^2 + 5x)^2 - 5(4x^2 + 5x) - 6$  as a product of four linear factors.

59 Titanium-44 is a radioactive isotope such that every 63 years, its mass decreases by half. For a sample of titanium-44 with an initial mass of 100 grams, write a function that will give the mass of the sample remaining after any amount of time. Define all variables. Scientists sometimes use the average yearly decrease in mass for estimation purposes. Use the average yearly decrease in mass of the sample between year 0 and year 10 to predict the amount of the sample remaining after 40 years. Round your answer to the *nearest tenth*. Is the actual mass of the sample or the estimated mass greater after 40 years? Justify your answer.

60 Stephanie found that the number of white-winged cross bills in an area can be represented by the formula  $C = 550(1.08)^t$ , where  $t$  represents the number of years since 2010. Which equation correctly represents the number of white-winged cross bills in terms of the monthly rate of population growth?

1)  $C = 550(1.00643)^t$

2)  $C = 550(1.00643)^{12t}$

3)  $C = 550(1.00643)^{\frac{t}{12}}$

4)  $C = 550(1.00643)^{t+12}$

61 Which expression has been rewritten correctly to form a true statement?

1)  $(x + 2)^2 + 2(x + 2) - 8 = (x + 6)x$

2)  $x^4 + 4x^2 + 9x^2y^2 - 36y^2 = (x + 3y)^2(x - 2)^2$

3)  $x^3 + 3x^2 - 4xy^2 - 12y^2 = (x - 2y)(x + 3)^2$

4)  $(x^2 - 4)^2 - 5(x^2 - 4) - 6 = (x^2 - 7)(x^2 - 6)$

62 Express the fraction  $\frac{2x^{\frac{3}{2}}}{(16x^4)^{\frac{1}{4}}}$  in simplest radical form.

63 Solve algebraically for all values of  $x$ :  
 $\sqrt{x-5} + x = 7$

64 The value(s) of  $x$  that satisfy

$$\sqrt{x^2 - 4x - 5} = 2x - 10 \text{ are}$$

- 1) {5}
- 2) {7}
- 3) {5, 7}
- 4) {3, 5, 7}

65 The roots of the equation  $3x^2 + 2x = -7$  are

- 1)  $-2, -\frac{1}{3}$
- 2)  $-\frac{7}{3}, 1$
- 3)  $-\frac{1}{3} \pm \frac{2i\sqrt{5}}{3}$
- 4)  $-\frac{1}{3} \pm \frac{\sqrt{11}}{3}$

66 What are the zeros of  $P(m) = (m^2 - 4)(m^2 + 1)$ ?

- 1) 2 and -2, only
- 2) 2, -2, and -4
- 3) -4,  $i$ , and  $-i$
- 4) 2, -2,  $i$ , and  $-i$

67 A public opinion poll was conducted on behalf of Mayor Ortega's reelection campaign shortly before the election. 264 out of 550 likely voters said they would vote for Mayor Ortega; the rest said they would vote for his opponent. Which statement is *least* appropriate to make, according to the results of the poll?

- 1) There is a 48% chance that Mayor Ortega will win the election.
- 2) The point estimate ( $\hat{p}$ ) of voters who will vote for Mayor Ortega is 48%.
- 3) It is most likely that between 44% and 52% of voters will vote for Mayor Ortega.
- 4) Due to the margin of error, an inference cannot be made regarding whether Mayor Ortega or his opponent is most likely to win the election.

68 Given:  $h(x) = \frac{2}{9}x^3 + \frac{8}{9}x^2 - \frac{16}{13}x + 2$

$$k(x) = -|0.7x| + 5$$

State the solutions to the equation  $h(x) = k(x)$ , rounded to the *nearest hundredth*.

69 Consider the system shown below.

$$2x - y = 4$$

$$(x + 3)^2 + y^2 = 8$$

The two solutions of the system can be described as

- 1) both imaginary
- 2) both irrational
- 3) both rational
- 4) one rational and one irrational

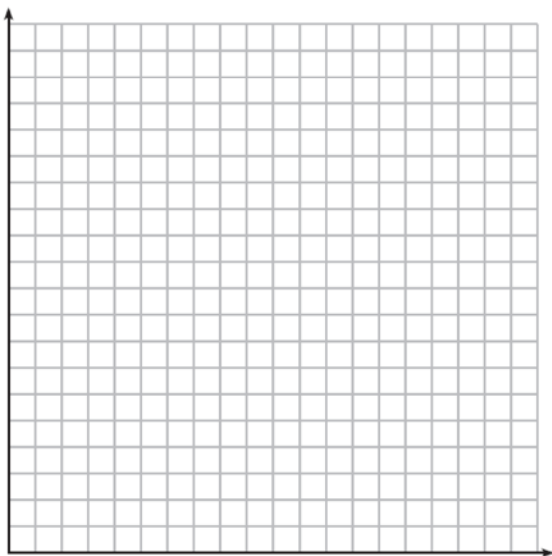
70 Evaluate  $j(-1)$  given

$j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$ . Explain what your answer tells you about  $x + 1$  as a factor. Algebraically find the remaining zeros of  $j(x)$ .

Algebra II Regents Exam Questions at Random

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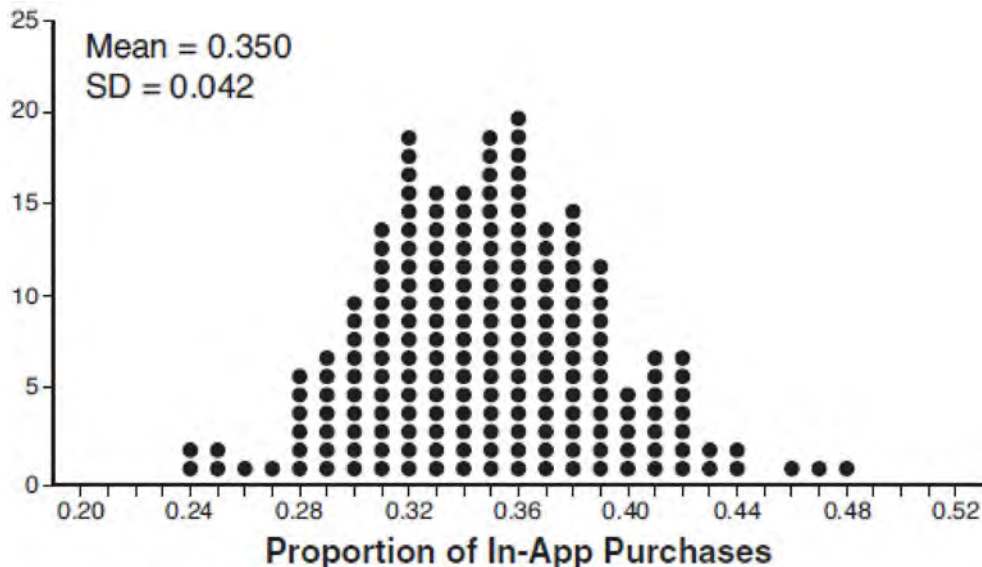
- 71 The value of a certain small passenger car based on its use in years is modeled by  $V(t) = 28482.698(0.684)^t$ , where  $V(t)$  is the value in dollars and  $t$  is the time in years. Zach had to take out a loan to purchase the small passenger car. The function  $Z(t) = 22151.327(0.778)^t$ , where  $Z(t)$  is measured in dollars, and  $t$  is the time in years, models the unpaid amount of Zach's loan over time. Graph  $V(t)$  and  $Z(t)$  over the interval  $0 \leq t \leq 5$ , on the set of axes below.



State when  $V(t) = Z(t)$ , to the *nearest hundredth*, and interpret its meaning in the context of the problem. Zach takes out an insurance policy that requires him to pay a \$3000 deductible in case of a collision. Zach will cancel the collision policy when the value of his car equals his deductible. To the *nearest year*, how long will it take Zach to cancel this policy? Justify your answer.

- 72 Which equation represents an odd function?  
 1)  $y = \sin x$   
 2)  $y = \cos x$   
 3)  $y = (x + 1)^3$   
 4)  $y = e^{5x}$
- 73 The volume of air in a person's lungs, as the person breathes in and out, can be modeled by a sine graph. A scientist is studying the differences in this volume for people at rest compared to people told to take a deep breath. When examining the graphs, should the scientist focus on the amplitude, period, or midline? Explain your choice.
- 74 Two versions of a standardized test are given, an April version and a May version. The statistics for the April version show a mean score of 480 and a standard deviation of 24. The statistics for the May version show a mean score of 510 and a standard deviation of 20. Assume the scores are normally distributed. Joanne took the April version and scored in the interval 510-540. What is the probability, to the *nearest ten thousandth*, that a test paper selected at random from the April version scored in the same interval? Maria took the May version. In what interval must Maria score to claim she scored as well as Joanne?
- 75 Mrs. Jones had hundreds of jelly beans in a bag that contained equal numbers of six different flavors. Her student randomly selected four jelly beans and they were all black licorice. Her student complained and said "What are the odds I got all of that kind?" Mrs. Jones replied, "simulate rolling a die 250 times and tell me if four black licorice jelly beans is unusual." Explain how this simulation could be used to solve the problem.

- 76 Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below.



Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results. In the given context, explain what this value represents.

- 77 A study of the annual population of the red-winged blackbird in Ft. Mill, South Carolina, shows the population,  $B(t)$ , can be represented by the function  $B(t) = 750(1.16)^t$ , where the  $t$  represents the number of years since the study began. In terms of the monthly rate of growth, the population of red-winged blackbirds can be best approximated by the function

- 1)  $B(t) = 750(1.012)^t$
- 2)  $B(t) = 750(1.012)^{12t}$
- 3)  $B(t) = 750(1.16)^{12t}$
- 4)  $B(t) = 750(1.16)^{\frac{t}{12}}$

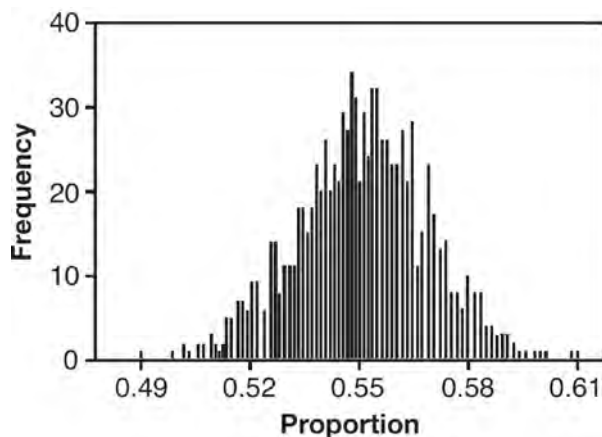
- 78 As  $x$  increases from 0 to  $\frac{\pi}{2}$ , the graph of the equation  $y = 2 \tan x$  will
- 1) increase from 0 to 2
  - 2) decrease from 0 to  $-2$
  - 3) increase without limit
  - 4) decrease without limit

- 79 Algebraically determine the values of  $x$  that satisfy the system of equations below.

$$y = -2x + 1$$

$$y = -2x^2 + 3x + 1$$

- 80 A candidate for political office commissioned a poll. His staff received responses from 900 likely voters and 55% of them said they would vote for the candidate. The staff then conducted a simulation of 1000 more polls of 900 voters, assuming that 55% of voters would vote for their candidate. The output of the simulation is shown in the diagram below.



Given this output, and assuming a 95% confidence level, the margin of error for the poll is closest to

- 1) 0.01
  - 2) 0.03
  - 3) 0.06
  - 4) 0.12
- 81 What is the solution set of the equation

$$\frac{3x+25}{x+7} - 5 = \frac{3}{x}?$$

- 1)  $\left\{\frac{3}{2}, 7\right\}$
- 2)  $\left\{\frac{7}{2}, -3\right\}$
- 3)  $\left\{-\frac{3}{2}, 7\right\}$
- 4)  $\left\{-\frac{7}{2}, -3\right\}$

- 82 Sally's high school is planning their spring musical. The revenue,  $R$ , generated can be determined by the function  $R(t) = -33t^2 + 360t$ , where  $t$  represents the price of a ticket. The production cost,  $C$ , of the musical is represented by the function  $C(t) = 700 + 5t$ . What is the highest ticket price, to the *nearest dollar*, they can charge in order to *not* lose money on the event?

- 1)  $t = 3$
- 2)  $t = 5$
- 3)  $t = 8$
- 4)  $t = 11$

- 83 Given events  $A$  and  $B$ , such that  $P(A) = 0.6$ ,  $P(B) = 0.5$ , and  $P(A \cup B) = 0.8$ , determine whether  $A$  and  $B$  are independent or dependent.

- 84 A sine function increasing through the origin can be used to model light waves. Violet light has a wavelength of 400 nanometers. Over which interval is the height of the wave *decreasing*, only?

- 1)  $(0, 200)$
- 2)  $(100, 300)$
- 3)  $(200, 400)$
- 4)  $(300, 400)$

- 85 If  $A = -3 + 5i$ ,  $B = 4 - 2i$ , and  $C = 1 + 6i$ , where  $i$  is the imaginary unit, then  $A - BC$  equals

- 1)  $5 - 17i$
- 2)  $5 + 27i$
- 3)  $-19 - 17i$
- 4)  $-19 + 27i$

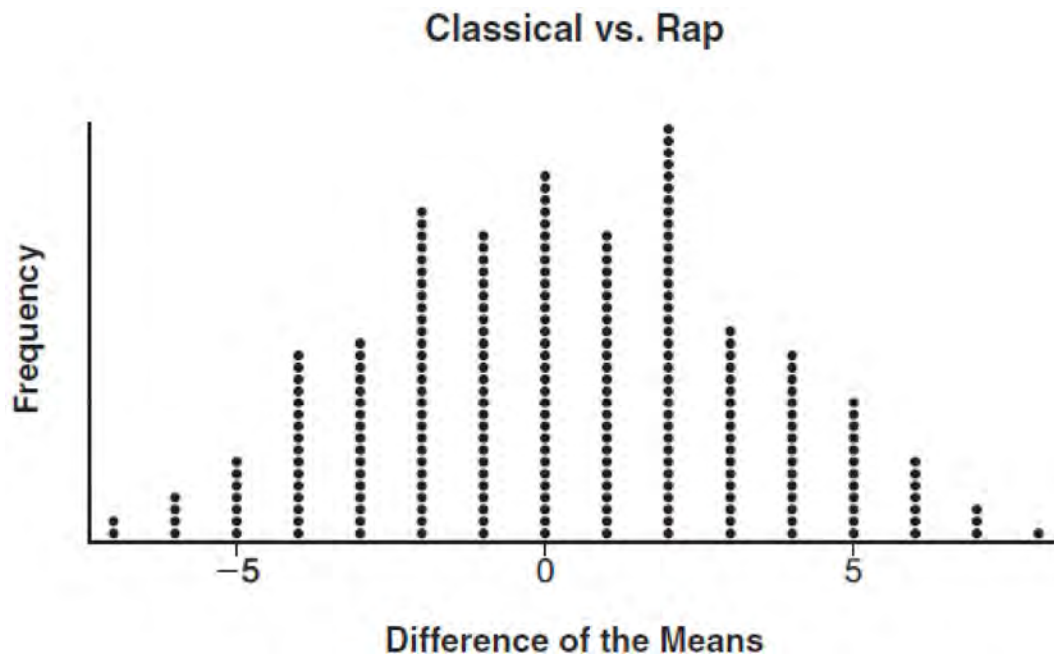


- 86 To determine if the type of music played while taking a quiz has a relationship to results, 16 students were randomly assigned to either a room softly playing classical music or a room softly playing rap music. The results on the quiz were as follows:

Classical: 74, 83, 77, 77, 84, 82, 90, 89

Rap: 77, 80, 78, 74, 69, 72, 78, 69

John correctly rounded the difference of the means of his experimental groups as 7. How did John obtain this value and what does it represent in the given context? Justify your answer. To determine if there is any significance in this value, John rerandomized the 16 scores into two groups of 8, calculated the difference of the means, and simulated this process 250 times as shown below.



Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

- 87 Which factorization is *incorrect*?

- 1)  $4k^2 - 49 = (2k + 7)(2k - 7)$
- 2)  $a^3 - 8b^3 = (a - 2b)(a^2 + 2ab + 4b^2)$
- 3)  $m^3 + 3m^2 - 4m + 12 = (m - 2)^2(m + 3)$
- 4)  $t^3 + 5t^2 + 6t + t^2 + 5t + 6 = (t + 1)(t + 2)(t + 3)$

- 88 Which expression is equivalent to  $(3k - 2i)^2$ , where  $i$  is the imaginary unit?

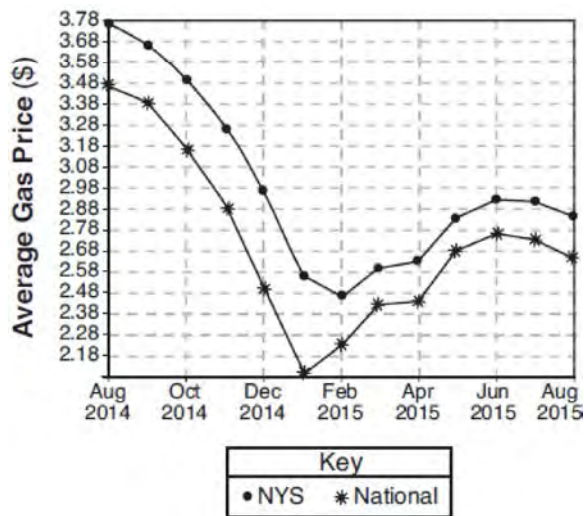
- 1)  $9k^2 - 4$
- 2)  $9k^2 + 4$
- 3)  $9k^2 - 12ki - 4$
- 4)  $9k^2 - 12ki + 4$

89 Over the set of integers, factor the expression  $x^4 - 4x^2 - 12$ .

90 The solutions to the equation  $-\frac{1}{2}x^2 = -6x + 20$  are

- 1)  $-6 \pm 2i$
- 2)  $-6 \pm 2\sqrt{19}$
- 3)  $6 \pm 2i$
- 4)  $6 \pm 2\sqrt{19}$

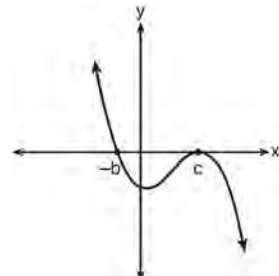
91 The graph below represents national and New York State average gas prices.



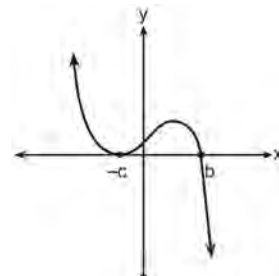
If New York State's gas prices are modeled by  $G(x)$  and  $C > 0$ , which expression best approximates the national average  $x$  months from August 2014?

- 1)  $G(x + C)$
- 2)  $G(x) + C$
- 3)  $G(x - C)$
- 4)  $G(x) - C$

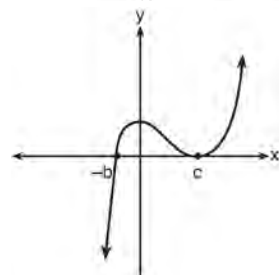
92 If  $a$ ,  $b$ , and  $c$  are all positive real numbers, which graph could represent the sketch of the graph of  $p(x) = -a(x + b)(x^2 - 2cx + c^2)$ ?



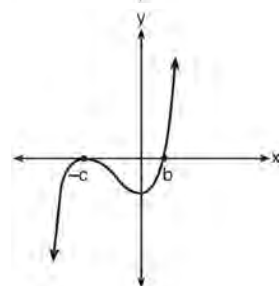
1)



2)



3)



4)

93 Write  $(5 + 2yi)(4 - 3i) - (5 - 2yi)(4 - 3i)$  in  $a + bi$  form, where  $y$  is a real number.

Algebra II Regents Exam Questions at Random

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- 94 Solve the following system of equations algebraically for all values of  $x$ ,  $y$ , and  $z$ :

$$2x + 3y - 4z = -1$$

$$x - 2y + 5z = 3$$

$$-4x + y + z = 16$$

- 95 If  $p(x) = 2\ln(x) - 1$  and  $m(x) = \ln(x + 6)$ , then what is the solution for  $p(x) = m(x)$ ?

- 1) 1.65
- 2) 3.14
- 3) 5.62
- 4) no solution

- 96 Mr. Farison gave his class the three mathematical rules shown below to either prove or disprove.

Which rules can be proved for all real numbers?

I  $(m + p)^2 = m^2 + 2mp + p^2$

II  $(x + y)^3 = x^3 + 3xy + y^3$

III  $(a^2 + b^2)^2 = (a^2 - b^2)^2 + (2ab)^2$

- 1) I, only
- 2) I and II
- 3) II and III
- 4) I and III

- 97 Which expression is equivalent to

$$x^6y^4(x^4 - 16) - 9(x^4 - 16)?$$

- 1)  $x^{10}y^4 - 16x^6y^4 - 9x^4 - 144$
- 2)  $(x^6y^4 - 9)(x + 2)^3(x - 2)$
- 3)  $(x^3y^2 + 3)(x^3y^2 - 3)(x + 2)^2(x - 2)^2$
- 4)  $(x^3y^2 + 3)(x^3y^2 - 3)(x^2 + 4)(x^2 - 4)$

- 98 What does  $\left(\frac{-54x^9}{y^4}\right)^{\frac{2}{3}}$  equal?

1)  $\frac{9ix^6\sqrt[3]{4}}{y^2\sqrt[3]{y^2}}$

2)  $\frac{9ix^6\sqrt[3]{4}}{y^2\sqrt[3]{y^2}}$

3)  $\frac{9x^6\sqrt[3]{4}}{y^2\sqrt[3]{y}}$

4)  $\frac{9x^6\sqrt[3]{4}}{y^2\sqrt[3]{y^2}}$

- 99 Which statement(s) about statistical studies is true?

- I. A survey of all English classes in a high school would be a good sample to determine the number of hours students throughout the school spend studying.
- II. A survey of all ninth graders in a high school would be a good sample to determine the number of student parking spaces needed at that high school.
- III. A survey of all students in one lunch period in a high school would be a good sample to determine the number of hours adults spend on social media websites.
- IV. A survey of all Calculus students in a high school would be a good sample to determine the number of students throughout the school who don't like math.

- 1) I, only
- 2) II, only
- 3) I and III
- 4) III and IV

Algebra II Regents Exam Questions at Random

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- 100 Using a microscope, a researcher observed and recorded the number of bacteria spores on a large sample of uniformly sized pieces of meat kept at room temperature. A summary of the data she recorded is shown in the table below.

Hours (x)	Average Number of Spores (y)
0	4
0.5	10
1	15
2	60
3	260
4	1130
6	16,380

Using these data, write an exponential regression equation, rounding all values to the *nearest thousandth*. The researcher knows that people are likely to suffer from food-borne illness if the number of spores exceeds 100. Using the exponential regression equation, determine the maximum amount of time, to the *nearest quarter hour*, that the meat can be kept at room temperature safely.

- 101 The height above ground for a person riding a Ferris wheel after  $t$  seconds is modeled by
- $$h(t) = 150 \sin\left(\frac{\pi}{45}t + 67.5\right) + 160 \text{ feet.}$$

How many seconds does it take to go from the bottom of the wheel to the top of the wheel?

- 1) 10
- 2) 45
- 3) 90
- 4) 150

- 102 The function  $f(x) = \frac{x-3}{x^2+2x-8}$  is undefined when

$x$  equals

- 1) 2 or  $-4$
- 2) 4 or  $-2$
- 3) 3, only
- 4) 2, only

- 103 Given  $z(x) = 6x^3 + bx^2 - 52x + 15$ ,  $z(2) = 35$ , and  $z(-5) = 0$ , algebraically determine all the zeros of  $z(x)$ .

- 104 The parabola described by the equation

$$y = \frac{1}{12}(x-2)^2 + 2$$

has the directrix at  $y = -1$ . The focus of the parabola is

- 1)  $(2, -1)$
- 2)  $(2, 2)$
- 3)  $(2, 3)$
- 4)  $(2, 5)$

- 105 Solve for all values of  $p$ :  $\frac{3p}{p-5} - \frac{2}{p+3} = \frac{p}{p+3}$

Algebra II Regents Exam Questions at Random

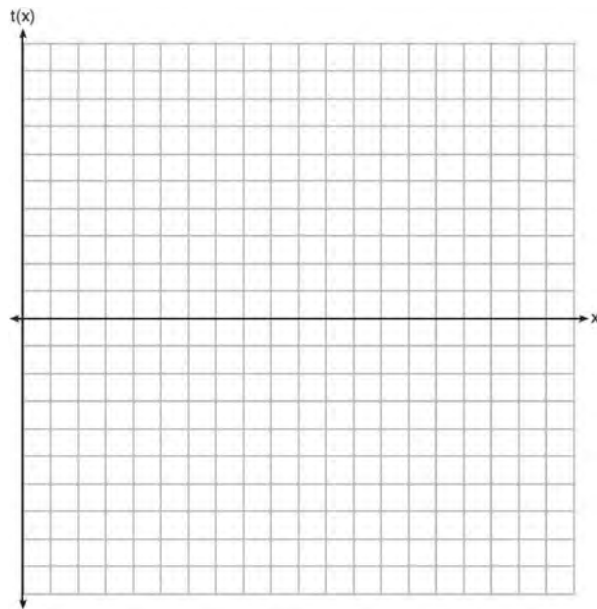
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- 106 Which scenario is best described as an observational study?
- 1) For a class project, students in Health class ask every tenth student entering the school if they eat breakfast in the morning.
  - 2) A social researcher wants to learn whether or not there is a link between attendance and grades. She gathers data from 15 school districts.
  - 3) A researcher wants to learn whether or not there is a link between children's daily amount of physical activity and their overall energy level. During lunch at the local high school, she distributed a short questionnaire to students in the cafeteria.
  - 4) Sixty seniors taking a course in Advanced Algebra Concepts are randomly divided into two classes. One class uses a graphing calculator all the time, and the other class never uses graphing calculators. A guidance counselor wants to determine whether there is a link between graphing calculator use and students' final exam grades.

- 107 Given  $f(x) = \frac{1}{2}x + 8$ , which equation represents the inverse,  $g(x)$ ?
- 1)  $g(x) = 2x - 8$
  - 2)  $g(x) = 2x - 16$
  - 3)  $g(x) = -\frac{1}{2}x + 8$
  - 4)  $g(x) = -\frac{1}{2}x - 16$

- 108 Simplify  $xi(i - 7i)^2$ , where  $i$  is the imaginary unit.

- 109 Graph  $t(x) = 3 \sin(2x) + 2$  over the domain  $[0, 2\pi]$  on the set of axes below.

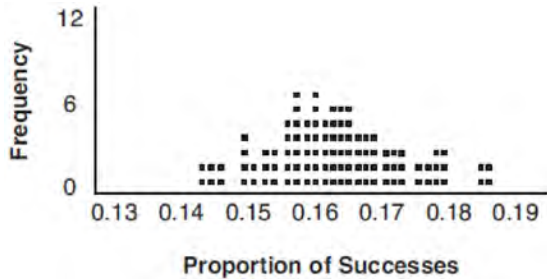


- 110 Which expression is equivalent to  $\frac{4x^3 + 9x - 5}{2x - 1}$ ,

where  $x \neq \frac{1}{2}$ ?

- 1)  $2x^2 + x + 5$
  - 2)  $2x^2 + \frac{11}{2} + \frac{1}{2(2x - 1)}$
  - 3)  $2x^2 - x + 5$
  - 4)  $2x^2 - x + 4 + \frac{1}{2x - 1}$
- 111 Given  $c(m) = m^3 - 2m^2 + 4m - 8$ , the solution of  $c(m) = 0$  is
- 1)  $\pm 2$
  - 2) 2, only
  - 3)  $2i, 2$
  - 4)  $\pm 2i, 2$

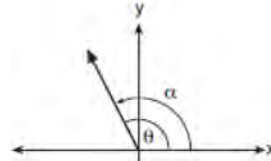
- 112 A study conducted in 2004 in New York City found that 212 out of 1334 participants had hypertension. Kim ran a simulation of 100 studies based on these data. The output of the simulation is shown in the diagram below.



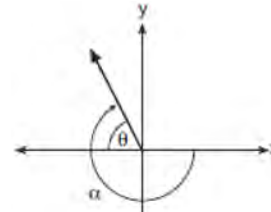
At a 95% confidence level, the proportion of New York City residents with hypertension and the margin of error are closest to

- 1) proportion  $\approx .16$ ; margin of error  $\approx .01$
  - 2) proportion  $\approx .16$ ; margin of error  $\approx .02$
  - 3) proportion  $\approx .01$ ; margin of error  $\approx .16$
  - 4) proportion  $\approx .02$ ; margin of error  $\approx .16$
- 113 Which statement is *incorrect* for the graph of the function  $y = -3 \cos \left[ \frac{\pi}{3} (x - 4) \right] + 7$ ?
- 1) The period is 6.
  - 2) The amplitude is 3.
  - 3) The range is  $[4, 10]$ .
  - 4) The midline is  $y = -4$ .
- 114 Which binomial is *not* a factor of the expression  $x^3 - 11x^2 + 16x + 84$ ?
- 1)  $x + 2$
  - 2)  $x + 4$
  - 3)  $x - 6$
  - 4)  $x - 7$

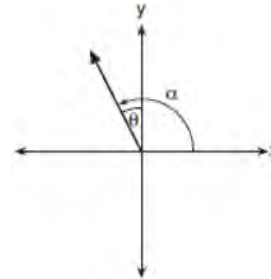
- 115 Which diagram represents an angle,  $\alpha$ , measuring  $\frac{13\pi}{20}$  radians drawn in standard position, and its reference angle,  $\theta$ ?



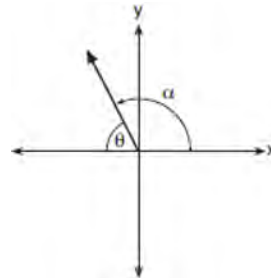
1)



2)



3)



4)

116 The  $x$ -value of which function's  $x$ -intercept is larger,  $f$  or  $h$ ? Justify your answer.

$$f(x) = \log(x - 4)$$

$x$	$h(x)$
-1	6
0	4
1	2
2	0
3	-2

117 A researcher randomly divides 50 bean plants into two groups. He puts one group by a window to receive natural light and the second group under artificial light. He records the growth of the plants weekly. Which data collection method is described in this situation?

- 1) observational study
- 2) controlled experiment
- 3) survey
- 4) systematic sample

118 A payday loan company makes loans between \$100 and \$1000 available to customers. Every 14 days, customers are charged 30% interest with compounding. In 2013, Remi took out a \$300 payday loan. Which expression can be used to calculate the amount she would owe, in dollars, after one year if she did not make payments?

- 1)  $300(.30)^{\frac{14}{365}}$
- 2)  $300(1.30)^{\frac{14}{365}}$
- 3)  $300(.30)^{\frac{365}{14}}$
- 4)  $300(1.30)^{\frac{365}{14}}$

119 Solve the equation  $\sqrt{2x - 7} + x = 5$  algebraically, and justify the solution set.

120 Solve the following system of equations algebraically for all values of  $x$ ,  $y$ , and  $z$ :

$$x + 3y + 5z = 45$$

$$6x - 3y + 2z = -10$$

$$-2x + 3y + 8z = 72$$

121 Use the properties of rational exponents to determine the value of  $y$  for the equation:

$$\frac{\sqrt[3]{x^8}}{(x^4)^{\frac{1}{3}}} = x^y, \quad x > 1$$

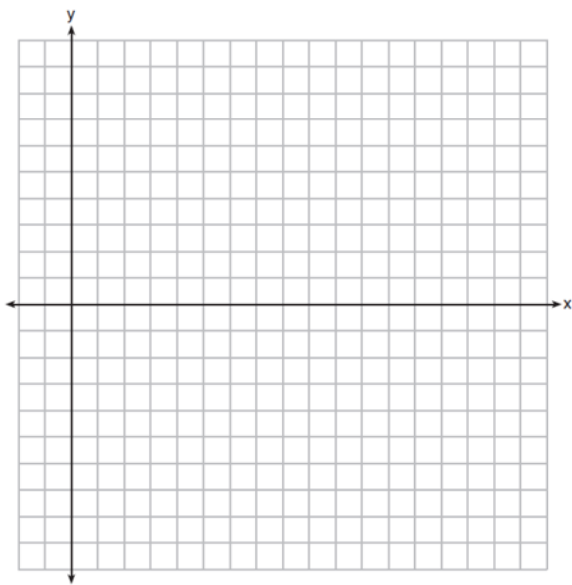
122 Algebraically solve for  $x$ :  $\frac{-3}{x+3} + \frac{1}{2} = \frac{x}{6} - \frac{1}{2}$

- 123 A major car company analyzes its revenue,  $R(x)$ , and costs  $C(x)$ , in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years,  $x$ , using the given functions.

$$R(x) = 550x^3 - 12,000x^2 + 83,000x + 7000$$

$$C(x) = 880x^3 - 21,000x^2 + 150,000x - 160,000$$

The company's profits can be represented as the difference between its revenue and costs. Write the profit function,  $P(x)$ , as a polynomial in standard form. Graph  $y = P(x)$  on the set of axes below over the domain  $2 \leq x \leq 16$ .

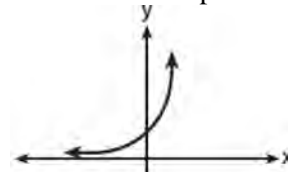


Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

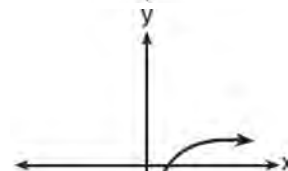
- 124 Verify the following Pythagorean identity for all values of  $x$  and  $y$ :

$$(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$$

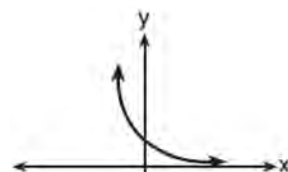
- 125 Which sketch best represents the graph of  $x = 3^y$ ?



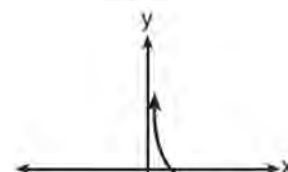
1)



2)



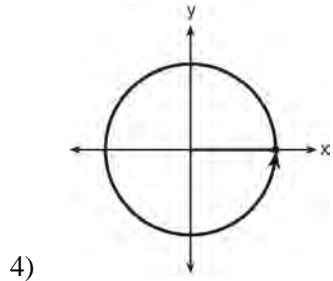
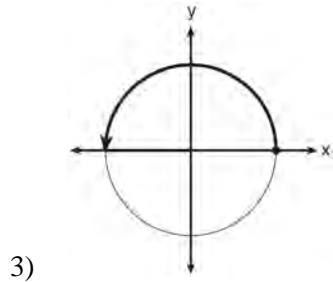
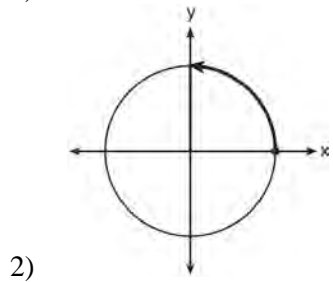
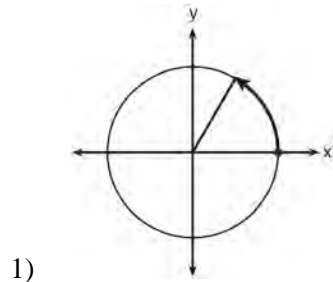
3)



4)



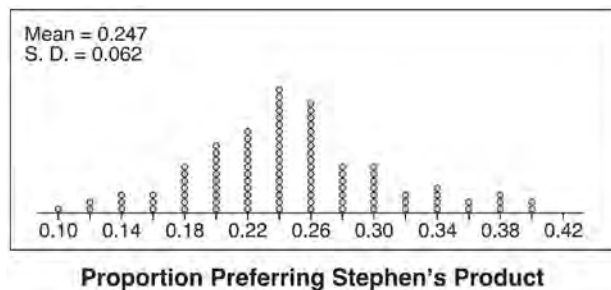
126 Which diagram shows an angle rotation of 1 radian on the unit circle?



127 Factored completely,  $m^5 + m^3 - 6m$  is equivalent to

- 1)  $(m + 3)(m - 2)$
- 2)  $(m^2 + 3m)(m^2 - 2)$
- 3)  $m(m^4 + m^2 - 6)$
- 4)  $m(m^2 + 3)(m^2 - 2)$

128 Stephen's Beverage Company is considering whether to produce a new brand of cola. The company will launch the product if at least 25% of cola drinkers will buy the product. Fifty cola drinkers are randomly selected to take a blind taste-test of products  $A$ ,  $B$ , and the new product. Nine out of fifty participants preferred Stephen's new cola to products  $A$  and  $B$ . The company then devised a simulation based on the requirement that 25% of cola drinkers will buy the product. Each dot in the graph shown below represents the proportion of people who preferred Stephen's new product, each of sample size 50, simulated 100 times.



Assume the set of data is approximately normal and the company wants to be 95% confident of its results. Does the sample proportion obtained from the blind taste-test, nine out of fifty, fall within the margin of error developed from the simulation? Justify your answer. The company decides to continue developing the product even though only nine out of fifty participants preferred its brand of cola in the taste-test. Describe how the simulation data could be used to support this decision.

129 Write an explicit formula for  $a_n$ , the  $n$ th term of the recursively defined sequence below.

$$a_1 = x + 1$$

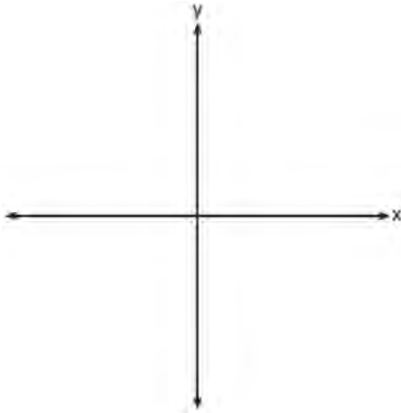
$$a_n = x(a_{n-1})$$

For what values of  $x$  would  $a_n = 0$  when  $n > 1$ ?

Algebra II Regents Exam Questions at Random

[www.jmap.org](http://www.jmap.org)

- 130 On the axes below, sketch a possible function  $p(x) = (x - a)(x - b)(x + c)$ , where  $a$ ,  $b$ , and  $c$  are positive,  $a > b$ , and  $p(x)$  has a positive  $y$ -intercept of  $d$ . Label all intercepts.

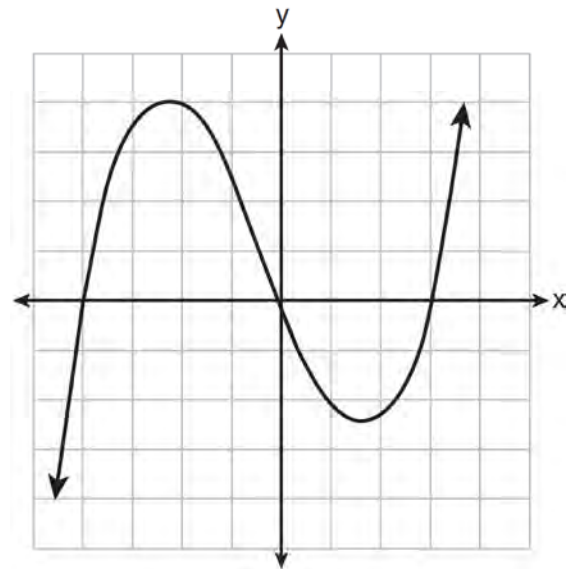


- 131 An equation to represent the value of a car after  $t$  months of ownership is  $v = 32,000(0.81)^{\frac{t}{12}}$ . Which statement is *not* correct?
- 1) The car lost approximately 19% of its value each month.
  - 2) The car maintained approximately 98% of its value each month.
  - 3) The value of the car when it was purchased was \$32,000.
  - 4) The value of the car 1 year after it was purchased was \$25,920.

- 132 A rabbit population doubles every 4 weeks. There are currently five rabbits in a restricted area. If  $t$  represents the time, in weeks, and  $P(t)$  is the population of rabbits with respect to time, about how many rabbits will there be in 98 days?
- 1) 56
  - 2) 152
  - 3) 3688
  - 4) 81,920

- 133 If  $\sin^2(32^\circ) + \cos^2(M) = 1$ , then  $M$  equals
- 1)  $32^\circ$
  - 2)  $58^\circ$
  - 3)  $68^\circ$
  - 4)  $72^\circ$

- 134 The graph of  $p(x)$  is shown below.



What is the remainder when  $p(x)$  is divided by  $x + 4$ ?

- 1)  $x - 4$
  - 2)  $-4$
  - 3)  $0$
  - 4)  $4$
- 135 What is the inverse of the function  $y = \log_3 x$ ?
- 1)  $y = x^3$
  - 2)  $y = \log_x 3$
  - 3)  $y = 3^x$
  - 4)  $x = 3^y$

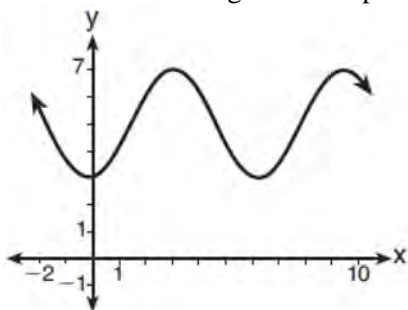
- 136 The focal length,  $F$ , of a camera's lens is related to the distance of the object from the lens,  $J$ , and the distance to the image area in the camera,  $W$ , by the formula below.

$$\frac{1}{J} + \frac{1}{W} = \frac{1}{F}$$

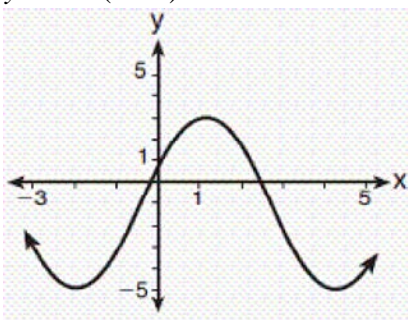
When this equation is solved for  $J$  in terms of  $F$  and  $W$ ,  $J$  equals

- 1)  $F - W$
- 2)  $\frac{FW}{F - W}$
- 3)  $\frac{FW}{W - F}$
- 4)  $\frac{1}{F} - \frac{1}{W}$

- 137 Which sinusoid has the greatest amplitude?



- 1)
- 2)  $y = 3 \sin(\theta - 3) + 5$



- 3)
- 4)  $y = -5 \sin(\theta - 1) - 3$

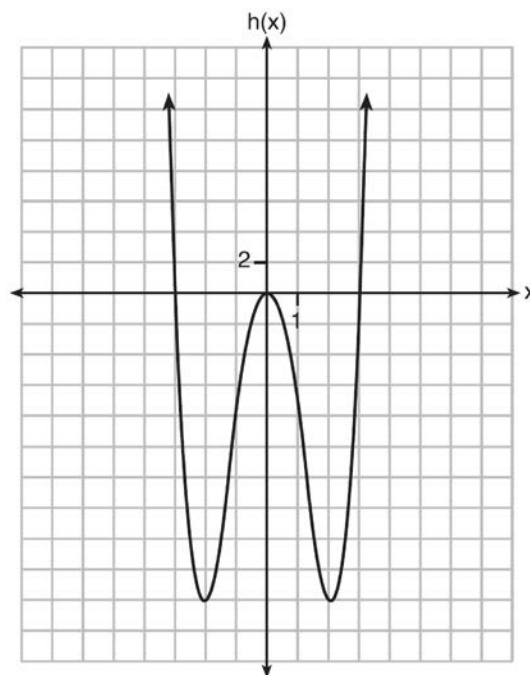
- 138 The expression  $\frac{6x^3 + 17x^2 + 10x + 2}{2x + 3}$  equals

- 1)  $3x^2 + 4x - 1 + \frac{5}{2x + 3}$
- 2)  $6x^2 + 8x - 2 + \frac{5}{2x + 3}$
- 3)  $6x^2 - x + 13 - \frac{37}{2x + 3}$
- 4)  $3x^2 + 13x + \frac{49}{2} + \frac{151}{2x + 3}$

- 139 Functions  $f$ ,  $g$ , and  $h$  are given below.

$$f(x) = \sin(2x)$$

$$g(x) = f(x) + 1$$



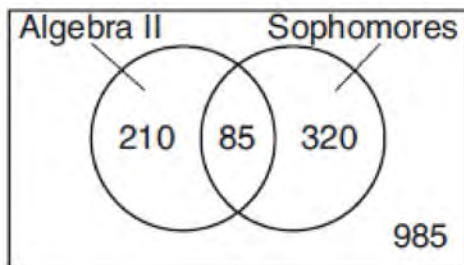
Which statement is true about functions  $f$ ,  $g$ , and  $h$ ?

- 1)  $f(x)$  and  $g(x)$  are odd,  $h(x)$  is even.
- 2)  $f(x)$  and  $g(x)$  are even,  $h(x)$  is odd.
- 3)  $f(x)$  is odd,  $g(x)$  is neither,  $h(x)$  is even.
- 4)  $f(x)$  is even,  $g(x)$  is neither,  $h(x)$  is odd.

Algebra II Regents Exam Questions at Random

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- 140 Data for the students enrolled in a local high school are shown in the Venn diagram below.



If a student from the high school is selected at random, what is the probability that the student is a sophomore given that the student is enrolled in Algebra II?

- 1)  $\frac{85}{210}$
  - 2)  $\frac{85}{295}$
  - 3)  $\frac{85}{405}$
  - 4)  $\frac{85}{1600}$
- 141 A polynomial equation of degree three,  $p(x)$ , is used to model the volume of a rectangular box. The graph of  $p(x)$  has  $x$  intercepts at  $-2$ ,  $10$ , and  $14$ . Which statements regarding  $p(x)$  could be true?
- A. The equation of  $p(x) = (x - 2)(x + 10)(x + 14)$ .
  - B. The equation of  $p(x) = -(x + 2)(x - 10)(x - 14)$ .
  - C. The maximum volume occurs when  $x = 10$ .
  - D. The maximum volume of the box is approximately 56.
- 1) A and C
  - 2) A and D
  - 3) B and C
  - 4) B and D

- 142 In 2010, the population of New York State was approximately 19,378,000 with an annual growth rate of 1.5%. Assuming the growth rate is maintained for a large number of years, which equation can be used to predict the population of New York State  $t$  years after 2010?

- 1)  $P_t = 19,378,000(1.5)^t$
- 2)  $P_0 = 19,378,000$   
 $P_t = 19,378,000 + 1.015P_{t-1}$
- 3)  $P_t = 19,378,000(1.015)^{t-1}$
- 4)  $P_0 = 19,378,000$   
 $P_t = 1.015P_{t-1}$

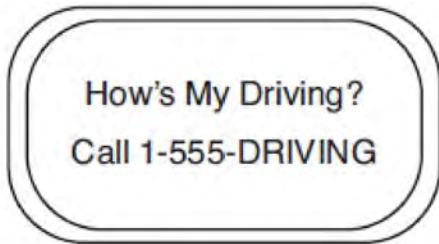
- 143 Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again. A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.

- 144 The expression  $\left(\frac{m^2}{m^{\frac{1}{3}}}\right)^{\frac{1}{2}}$  is equivalent to

- 1)  $-\sqrt[6]{m^5}$
- 2)  $\frac{1}{\sqrt[6]{m^5}}$
- 3)  $-m^5\sqrt{m}$
- 4)  $\frac{1}{m^5\sqrt{m}}$

## Algebra II Regents at Random

- 145 Chuck's Trucking Company has decided to initiate an Employee of the Month program. To determine the recipient, they put the following sign on the back of each truck.



The driver who receives the highest number of positive comments will win the recognition. Explain *one* statistical bias in this data collection method.

- 146 Solve the system of equations shown below algebraically.

$$(x - 3)^2 + (y + 2)^2 = 16$$

$$2x + 2y = 10$$

- 147 The equation  $4x^2 - 24x + 4y^2 + 72y = 76$  is equivalent to

- 1)  $4(x - 3)^2 + 4(y + 9)^2 = 76$
- 2)  $4(x - 3)^2 + 4(y + 9)^2 = 121$
- 3)  $4(x - 3)^2 + 4(y + 9)^2 = 166$
- 4)  $4(x - 3)^2 + 4(y + 9)^2 = 436$

- 148 According to a pricing website, Indroid phones lose 58% of their cash value over 1.5 years. Which expression can be used to estimate the value of a \$300 Indroid phone in 1.5 years?

- 1)  $300e^{-0.87}$
- 2)  $300e^{-0.63}$
- 3)  $300e^{-0.58}$
- 4)  $300e^{-0.42}$

- 149 For all values of  $x$  for which the expression is defined,  $\frac{x^3 + 2x^2 - 9x - 18}{x^3 - x^2 - 6x}$ , in simplest form, is

equivalent to

- 1) 3
- 2)  $-\frac{17}{2}$
- 3)  $\frac{x + 3}{x}$
- 4)  $\frac{x^2 - 9}{x(x - 3)}$

- 150 If  $g(c) = 1 - c^2$  and  $m(c) = c + 1$ , then which statement is *not* true?

- 1)  $g(c) \cdot m(c) = 1 + c - c^2 - c^3$
- 2)  $g(c) + m(c) = 2 + c - c^2$
- 3)  $m(c) - g(c) = c + c^2$
- 4)  $\frac{m(c)}{g(c)} = \frac{-1}{1 - c}$

151 Consider the function  $h(x) = 2\sin(3x) + 1$  and the function  $q$  represented in the table below.

$x$	$q(x)$
-2	-8
-1	0
0	0
1	-2
2	0

Determine which function has the *smaller* minimum value for the domain  $[-2, 2]$ . Justify your answer.

152 If  $ae^{bt} = c$ , where  $a$ ,  $b$ , and  $c$  are positive, then  $t$  equals

1)  $\ln\left(\frac{c}{ab}\right)$

2)  $\ln\left(\frac{cb}{a}\right)$

3)  $\frac{\ln\left(\frac{c}{a}\right)}{b}$

4)  $\frac{\ln\left(\frac{c}{a}\right)}{\ln b}$

153 Brian deposited 1 cent into an empty non-interest bearing bank account on the first day of the month. He then additionally deposited 3 cents on the second day, 9 cents on the third day, and 27 cents on the fourth day. What would be the total amount of money in the account at the end of the 20th day if the pattern continued?

- 1) \$11,622,614.67
- 2) \$17,433,922.00
- 3) \$116,226,146.80
- 4) \$1,743,392,200.00

154 The recursive formula to describe a sequence is shown below.

$$a_1 = 3$$

$$a_n = 1 + 2a_{n-1}$$

State the first four terms of this sequence. Can this sequence be represented using an explicit geometric formula? Justify your answer.

155 Given that  $\sin^2 \theta + \cos^2 \theta = 1$  and  $\sin \theta = -\frac{\sqrt{2}}{5}$ , what is a possible value of  $\cos \theta$ ?

1)  $\frac{5 + \sqrt{2}}{5}$

2)  $\frac{\sqrt{23}}{5}$

3)  $\frac{3\sqrt{3}}{5}$

4)  $\frac{\sqrt{35}}{5}$

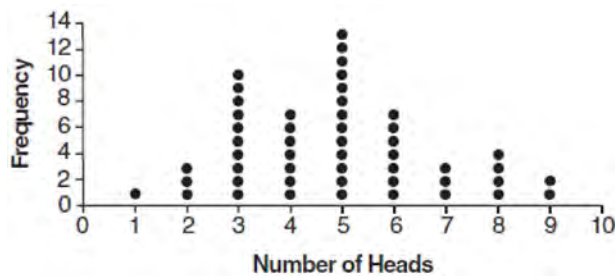
- 156 The solution to the equation  $4x^2 + 98 = 0$  is
- 1)  $\pm 7$
  - 2)  $\pm 7i$
  - 3)  $\pm \frac{7\sqrt{2}}{2}$
  - 4)  $\pm \frac{7i\sqrt{2}}{2}$
- 157 There are 440 students at Thomas Paine High School enrolled in U.S. History. On the April report card, the students' grades are approximately normally distributed with a mean of 79 and a standard deviation of 7. Students who earn a grade less than or equal to 64.9 must attend summer school. The number of students who must attend summer school for U.S. History is closest to
- 1) 3
  - 2) 5
  - 3) 10
  - 4) 22
- 158 A student studying public policy created a model for the population of Detroit, where the population decreased 25% over a decade. He used the model  $P = 714(0.75)^d$ , where  $P$  is the population, in thousands,  $d$  decades after 2010. Another student, Suzanne, wants to use a model that would predict the population after  $y$  years. Suzanne's model is best represented by
- 1)  $P = 714(0.6500)^y$
  - 2)  $P = 714(0.8500)^y$
  - 3)  $P = 714(0.9716)^y$
  - 4)  $P = 714(0.9750)^y$
- 159 Mallory wants to buy a new window air conditioning unit. The cost for the unit is \$329.99. If she plans to run the unit three months out of the year for an annual operating cost of \$108.78, which function models the cost per year over the lifetime of the unit,  $C(n)$ , in terms of the number of years,  $n$ , that she owns the air conditioner.
- 1)  $C(n) = 329.99 + 108.78n$
  - 2)  $C(n) = 329.99 + 326.34n$
  - 3)  $C(n) = \frac{329.99 + 108.78n}{n}$
  - 4)  $C(n) = \frac{329.99 + 326.34n}{n}$
- 160 For  $x \neq 0$ , which expressions are equivalent to one divided by the sixth root of  $x$ ?
- I.  $\frac{\sqrt[6]{x}}{\sqrt[3]{x}}$  II.  $\frac{x^{\frac{1}{6}}}{x^{\frac{1}{3}}}$  III.  $x^{\frac{-1}{6}}$
- 1) I and II, only
  - 2) I and III, only
  - 3) II and III, only
  - 4) I, II, and III
- 161 Researchers in a local area found that the population of rabbits with an initial population of 20 grew continuously at the rate of 5% per month. The fox population had an initial value of 30 and grew continuously at the rate of 3% per month. Find, to the *nearest tenth of a month*, how long it takes for these populations to be equal.

162 A runner is using a nine-week training app to prepare for a "fun run." The table below represents the amount of the program completed,  $A$ , and the distance covered in a session,  $D$ , in miles.

<b>A</b>	$\frac{4}{9}$	$\frac{5}{9}$	$\frac{6}{9}$	$\frac{8}{9}$	1
<b>D</b>	2	2	2.25	3	3.25

Based on these data, write an exponential regression equation, rounded to the *nearest thousandth*, to model the distance the runner is able to complete in a session as she continues through the nine-week program.

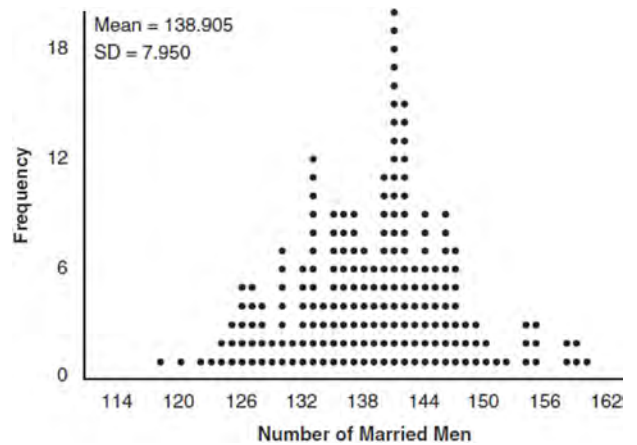
163 The results of simulating tossing a coin 10 times, recording the number of heads, and repeating this 50 times are shown in the graph below.



Based on the results of the simulation, which statement is *false*?

- 1) Five heads occurred most often, which is consistent with the theoretical probability of obtaining a heads.
- 2) Eight heads is unusual, as it falls outside the middle 95% of the data.
- 3) Obtaining three heads or fewer occurred 28% of the time.
- 4) Seven heads is not unusual, as it falls within the middle 95% of the data.

164 In a random sample of 250 men in the United States, age 21 or older, 139 are married. The graph below simulated samples of 250 men, 200 times, assuming that 139 of the men are married.



- a) Based on the simulation, create an interval in which the middle 95% of the number of married men may fall. Round your answer to the *nearest integer*.
- b) A study claims "50 percent of men 21 and older in the United States are married." Do your results from part a contradict this claim? Explain.



165 The expression  $\frac{-3x^2 - 5x + 2}{x^3 + 2x^2}$  can be rewritten as

- 1)  $\frac{-3x - 3}{x^2 + 2x}$
- 2)  $\frac{-3x - 1}{x^2}$
- 3)  $-3x^{-1} + 1$
- 4)  $-3x^{-1} + x^{-2}$

166 Write  $\sqrt[3]{x} \cdot \sqrt{x}$  as a single term with a rational exponent.

167 A certain pain reliever is taken in 220 mg dosages and has a half-life of 12 hours. The function

$$A = 220 \left( \frac{1}{2} \right)^{\frac{t}{12}}$$

can be used to model this situation,

where  $A$  is the amount of pain reliever in milligrams remaining in the body after  $t$  hours. According to this function, which statement is true?

- 1) Every hour, the amount of pain reliever remaining is cut in half.
- 2) In 12 hours, there is no pain reliever remaining in the body.
- 3) In 24 hours, there is no pain reliever remaining in the body.
- 4) In 12 hours, 110 mg of pain reliever is remaining.

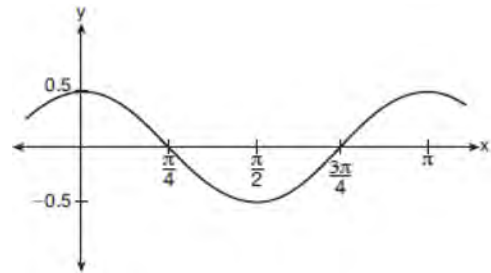
168 The graph of  $y = \log_2 x$  is translated to the right 1 unit and down 1 unit. The coordinates of the  $x$ -intercept of the translated graph are

- 1) (0,0)
- 2) (1,0)
- 3) (2,0)
- 4) (3,0)

169 Which binomial is a factor of  $x^4 - 4x^2 - 4x + 8$ ?

- 1)  $x - 2$
- 2)  $x + 2$
- 3)  $x - 4$
- 4)  $x + 4$

170 Which equation is represented by the graph shown below?

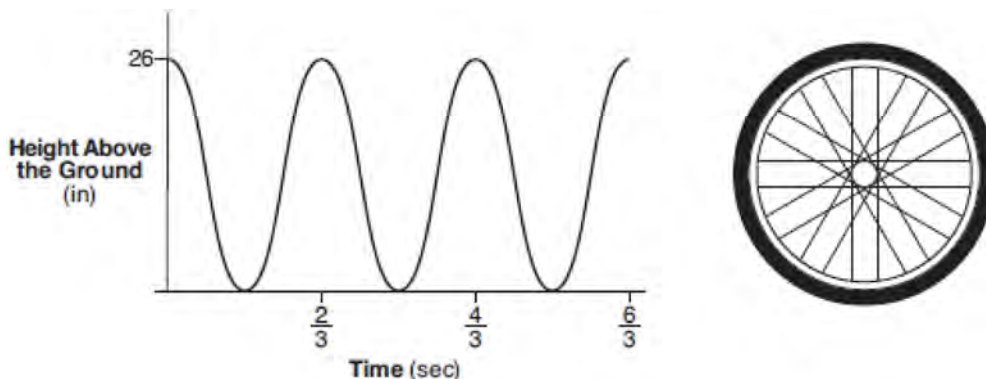


- 1)  $y = \frac{1}{2} \cos 2x$
- 2)  $y = \cos x$
- 3)  $y = \frac{1}{2} \cos x$
- 4)  $y = 2 \cos \frac{1}{2} x$

171 Judith puts \$5000 into an investment account with interest compounded continuously. Which approximate annual rate is needed for the account to grow to \$9110 after 30 years?

- 1) 2%
- 2) 2.2%
- 3) 0.02%
- 4) 0.022%

- 172 The graph below represents the height above the ground,  $h$ , in inches, of a point on a triathlete's bike wheel during a training ride in terms of time,  $t$ , in seconds.



Identify the period of the graph and describe what the period represents in this context.

- 173 The hours of daylight,  $y$ , in Utica in days,  $x$ , from January 1, 2013 can be modeled by the equation  $y = 3.06\sin(0.017x - 1.40) + 12.23$ . How many hours of daylight, to the *nearest tenth*, does this model predict for February 14, 2013?
- 1) 9.4
  - 2) 10.4
  - 3) 12.1
  - 4) 12.2
- 174 If  $p(x) = 2x^3 - 3x + 5$ , what is the remainder of  $p(x) \div (x - 5)$ ?
- 1) -230
  - 2) 0
  - 3) 40
  - 4) 240
- 175 In 2013, approximately 1.6 million students took the Critical Reading portion of the SAT exam. The mean score, the modal score, and the standard deviation were calculated to be 496, 430, and 115, respectively. Which interval reflects 95% of the Critical Reading scores?
- 1)  $430 \pm 115$
  - 2)  $430 \pm 230$
  - 3)  $496 \pm 115$
  - 4)  $496 \pm 230$
- 176 The profit function,  $p(x)$ , for a company is the cost function,  $c(x)$ , subtracted from the revenue function,  $r(x)$ . The profit function for the Acme Corporation is  $p(x) = -0.5x^2 + 250x - 300$  and the revenue function is  $r(x) = -0.3x^2 + 150x$ . The cost function for the Acme Corporation is
- 1)  $c(x) = 0.2x^2 - 100x + 300$
  - 2)  $c(x) = 0.2x^2 + 100x + 300$
  - 3)  $c(x) = -0.2x^2 + 100x - 300$
  - 4)  $c(x) = -0.8x^2 + 400x - 300$

- 177 Which statement regarding the graphs of the functions below is *untrue*?

$$f(x) = 3 \sin 2x, \text{ from } -\pi < x < \pi$$

$$g(x) = (x - 0.5)(x + 4)(x - 2)$$

$$h(x) = \log_2 x$$

$$j(x) = -|4x - 2| + 3$$

- 1)  $f(x)$  and  $j(x)$  have a maximum  $y$ -value of 3.
  - 2)  $f(x)$ ,  $h(x)$ , and  $j(x)$  have one  $y$ -intercept.
  - 3)  $g(x)$  and  $j(x)$  have the same end behavior as  $x \rightarrow -\infty$ .
  - 4)  $g(x)$ ,  $h(x)$ , and  $j(x)$  have rational zeros.
- 178 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function,  $C(t)$ , that represents the amount of money in the account  $t$  years after the account is opened, given that no more money is deposited into or withdrawn from the account. Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

- 179 The formula below can be used to model which scenario?

$$a_1 = 3000$$

$$a_n = 0.80a_{n-1}$$

- 1) The first row of a stadium has 3000 seats, and each row thereafter has 80 more seats than the row in front of it.
- 2) The last row of a stadium has 3000 seats, and each row before it has 80 fewer seats than the row behind it.
- 3) A bank account starts with a deposit of \$3000, and each year it grows by 80%.
- 4) The initial value of a specialty toy is \$3000, and its value each of the following years is 20% less.

- 180 The height,  $h(t)$  in cm, of a piston, is given by the equation  $h(t) = 12 \cos\left(\frac{\pi}{3}t\right) + 8$ , where  $t$  represents the number of seconds since the measurements began. Determine the average rate of change, in cm/sec, of the piston's height on the interval  $1 \leq t \leq 2$ . At what value(s) of  $t$ , to the *nearest tenth of a second*, does  $h(t) = 0$  in the interval  $1 \leq t \leq 5$ ? Justify your answer.

- 181 At her job, Pat earns \$25,000 the first year and receives a raise of \$1000 each year. The explicit formula for the  $n$ th term of this sequence is  $a_n = 25,000 + (n - 1)1000$ . Which rule best represents the equivalent recursive formula?
- 1)  $a_n = 24,000 + 1000n$
  - 2)  $a_n = 25,000 + 1000n$
  - 3)  $a_1 = 25,000, a_n = a_{n-1} + 1000$
  - 4)  $a_1 = 25,000, a_n = a_{n+1} + 1000$

- 182 The Wells family is looking to purchase a home in a suburb of Rochester with a 30-year mortgage that has an annual interest rate of 3.6%. The house the family wants to purchase is \$152,500 and they will make a \$15,250 down payment and borrow the remainder. Use the formula below to determine their monthly payment, to the *nearest dollar*.

$$M = \frac{P\left(\frac{r}{12}\right)\left(1 + \frac{r}{12}\right)^n}{\left(1 + \frac{r}{12}\right)^n - 1}$$

$M$  = monthly payment

$P$  = amount borrowed

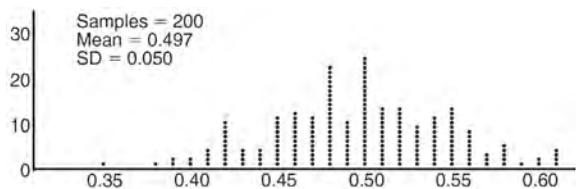
$r$  = annual interest rate

$n$  = total number of monthly payments

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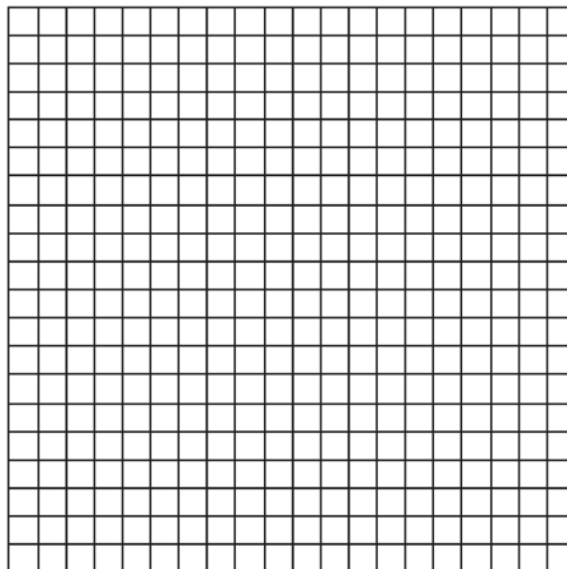
- 183 Anne has a coin. She does not know if it is a fair coin. She flipped the coin 100 times and obtained 73 heads and 27 tails. She ran a computer simulation of 200 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



Given the results of her coin flips and of her computer simulation, which statement is most accurate?

- 1) 73 of the computer's next 100 coin flips will be heads.
  - 2) 50 of her next 100 coin flips will be heads.
  - 3) Her coin is not fair.
  - 4) Her coin is fair.
- 184 On a given school day, the probability that Nick oversleeps is 48% and the probability he has a pop quiz is 25%. Assuming these two events are independent, what is the probability that Nick oversleeps and has a pop quiz on the same day?
- 1) 73%
  - 2) 36%
  - 3) 23%
  - 4) 12%
- 185 An orange-juice processing plant receives a truckload of oranges. The quality control team randomly chooses three pails of oranges, each containing 50 oranges, from the truckload. Identify the sample and the population in the given scenario. State *one* conclusion that the quality control team could make about the population if 5% of the sample was found to be unsatisfactory.

- 186 The zeros of a quartic polynomial function  $h$  are  $-1, \pm 2,$  and  $3$ . Sketch a graph of  $y = h(x)$  on the grid below.



- 187 The solution set for the equation  $\sqrt{56-x} = x$  is
- 1)  $\{-8, 7\}$
  - 2)  $\{-7, 8\}$
  - 3)  $\{7\}$
  - 4)  $\{ \}$

- 188 The graphs of the equations  $y = x^2 + 4x - 1$  and  $y + 3 = x$  are drawn on the same set of axes. One solution of this system is
- 1)  $(-5, -2)$
  - 2)  $(-1, -4)$
  - 3)  $(1, 4)$
  - 4)  $(-2, -1)$

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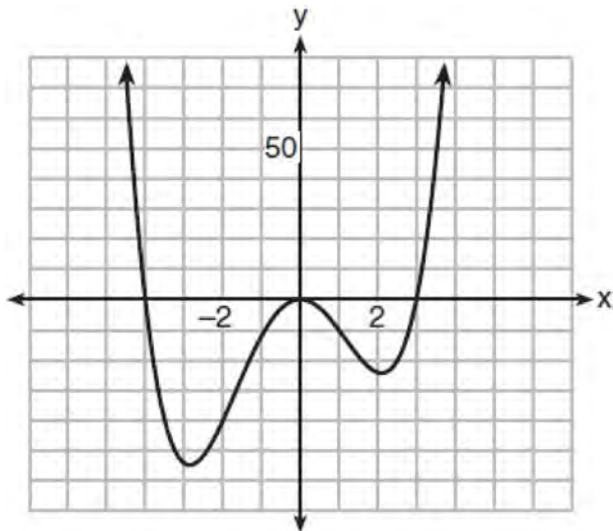
- 189 The loudness of sound is measured in units called decibels (dB). These units are measured by first assigning an intensity  $I_0$  to a very soft sound that is called the threshold sound. The sound to be measured is assigned an intensity,  $I$ , and the decibel rating,  $d$ , of this sound is found using  $d = 10 \log \frac{I}{I_0}$ . The threshold sound audible to the average person is  $1.0 \times 10^{-12}$  W/m<sup>2</sup> (watts per square meter). Consider the following sound level classifications:

Moderate	45-69 dB
Loud	70-89 dB
Very loud	90-109 dB
Deafening	>110 dB

How would a sound with intensity  $6.3 \times 10^{-3}$  W/m<sup>2</sup> be classified?

- |             |              |
|-------------|--------------|
| 1) moderate | 3) very loud |
| 2) loud     | 4) deafening |
- 190 When  $b > 0$  and  $d$  is a positive integer, the expression  $(3b)^{\frac{2}{d}}$  is equivalent to
- 1)  $\frac{1}{(\sqrt[d]{3b})^2}$
  - 2)  $(\sqrt{3b})^d$
  - 3)  $\frac{1}{\sqrt{3b^d}}$
  - 4)  $(\sqrt[d]{3b})^2$
- 191 Given  $f(9) = -2$ , which function can be used to generate the sequence  $-8, -7.25, -6.5, -5.75, \dots$ ?
- 1)  $f(n) = -8 + 0.75n$
  - 2)  $f(n) = -8 - 0.75(n - 1)$
  - 3)  $f(n) = -8.75 + 0.75n$
  - 4)  $f(n) = -0.75 + 8(n - 1)$
- 192 Express  $(1 - i)^3$  in  $a + bi$  form.
- 193 Which function represents exponential decay?
- 1)  $y = 2^{0.3t}$
  - 2)  $y = 1.2^{3t}$
  - 3)  $y = \left(\frac{1}{2}\right)^{-t}$
  - 4)  $y = 5^{-t}$
- 194 Which statement about the graph of  $c(x) = \log_6 x$  is *false*?
- 1) The asymptote has equation  $y = 0$ .
  - 2) The graph has no  $y$ -intercept.
  - 3) The domain is the set of positive reals.
  - 4) The range is the set of all real numbers.

- 195 The graph of  $y = f(x)$  is shown below. The function has a leading coefficient of 1.



Write an equation for  $f(x)$ . The function  $g$  is formed by translating function  $f$  left 2 units. Write an equation for  $g(x)$ .

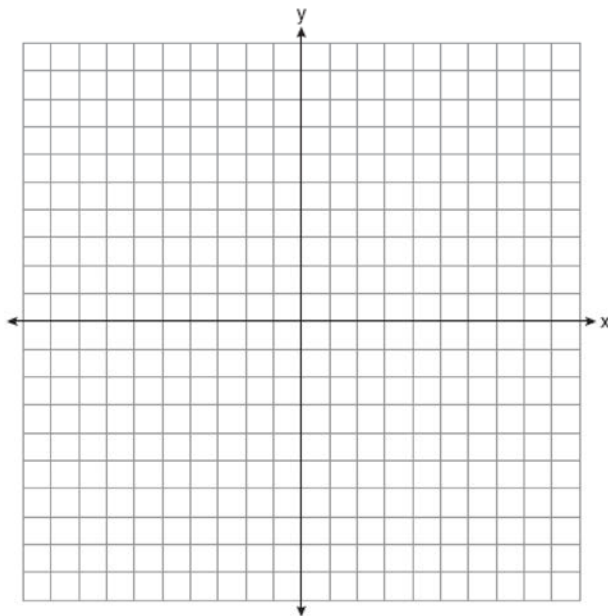
- 196 The probability that Gary and Jane have a child with blue eyes is 0.25, and the probability that they have a child with blond hair is 0.5. The probability that they have a child with both blue eyes and blond hair is 0.125. Given this information, the events blue eyes and blond hair are

- I: dependent
- II: independent
- III: mutually exclusive

- 1) I, only
- 2) II, only
- 3) I and III
- 4) II and III

- 197 A house purchased 5 years ago for \$100,000 was just sold for \$135,000. Assuming exponential growth, approximate the annual growth rate, to the nearest percent.

- 198 On the axes below, graph *one* cycle of a cosine function with amplitude 3, period  $\frac{\pi}{2}$ , midline  $y = -1$ , and passing through the point  $(0, 2)$ .



- 199 The speed of a tidal wave,  $s$ , in hundreds of miles per hour, can be modeled by the equation  $s = \sqrt{t} - 2t + 6$ , where  $t$  represents the time from its origin in hours. Algebraically determine the time when  $s = 0$ . How much faster was the tidal wave traveling after 1 hour than 3 hours, to the nearest mile per hour? Justify your answer.

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- 200 A formula for work problems involving two people is shown below.

$$\frac{1}{t_1} + \frac{1}{t_2} = \frac{1}{t_b}$$

$t_1$  = the time taken by the first person to complete the job

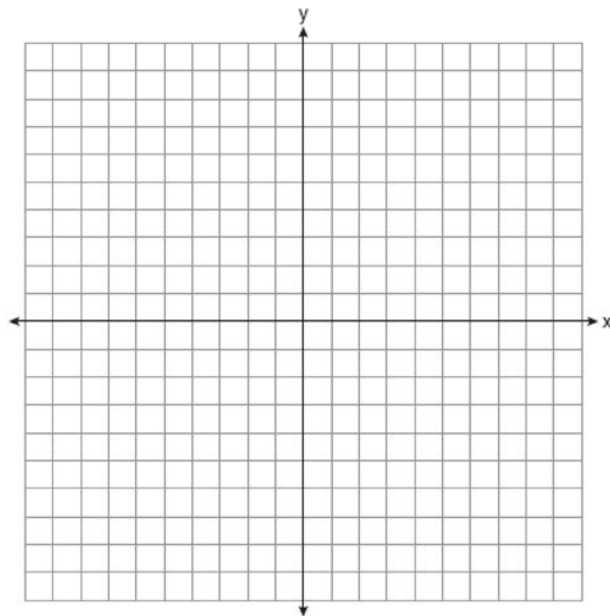
$t_2$  = the time taken by the second person to complete the job

$t_b$  = the time it takes for them working together to complete the job

Fred and Barney are carpenters who build the same model desk. It takes Fred eight hours to build the desk while it only takes Barney six hours. Write an equation that can be used to find the time it would take both carpenters working together to build a desk. Determine, to the *nearest tenth of an hour*, how long it would take Fred and Barney working together to build a desk.

- 201 A student is chosen at random from the student body at a given high school. The probability that the student selects Math as the favorite subject is  $\frac{1}{4}$ . The probability that the student chosen is a junior is  $\frac{116}{459}$ . If the probability that the student selected is a junior or that the student chooses Math as the favorite subject is  $\frac{47}{108}$ , what is the exact probability that the student selected is a junior whose favorite subject is Math? Are the events "the student is a junior" and "the student's favorite subject is Math" independent of each other? Explain your answer.

- 202 Graph  $y = \log_2(x + 3) - 5$  on the set of axes below. Use an appropriate scale to include *both* intercepts.



Describe the behavior of the given function as  $x$  approaches -3 and as  $x$  approaches positive infinity.

- 203 The Ferris wheel at the landmark Navy Pier in Chicago takes 7 minutes to make one full rotation. The height,  $H$ , in feet, above the ground of one of the six-person cars can be modeled by

$$H(t) = 70 \sin\left(\frac{2\pi}{7}(t - 1.75)\right) + 80, \text{ where } t \text{ is time,}$$

in minutes. Using  $H(t)$  for one full rotation, this car's minimum height, in feet, is

- 1) 150
- 2) 70
- 3) 10
- 4) 0

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204 For a given time,  $x$ , in seconds, an electric current,  $y$ , can be represented by  $y = 2.5(1 - 2.7^{-10x})$ .

Which equation is *not* equivalent?

- 1)  $y = 2.5 - 2.5(2.7^{-10x})$
- 2)  $y = 2.5 - 2.5\left((2.7^2)^{-0.5x}\right)$
- 3)  $y = 2.5 - 2.5\left(\frac{1}{2.7^{10x}}\right)$
- 4)  $y = 2.5 - 2.5(2.7^{-2})(2.7^{0.5x})$

205 A solution of the equation  $2x^2 + 3x + 2 = 0$  is

- 1)  $-\frac{3}{4} + \frac{1}{4}i\sqrt{7}$
- 2)  $-\frac{3}{4} + \frac{1}{4}i$
- 3)  $-\frac{3}{4} + \frac{1}{4}\sqrt{7}$
- 4)  $\frac{1}{2}$

206 If  $n = \sqrt{a^5}$  and  $m = a$ , where  $a > 0$ , an expression for  $\frac{n}{m}$  could be

- 1)  $a^{\frac{5}{2}}$
- 2)  $a^4$
- 3)  $\sqrt[3]{a^2}$
- 4)  $\sqrt{a^3}$

207 The directrix of the parabola  $12(y + 3) = (x - 4)^2$  has the equation  $y = -6$ . Find the coordinates of the focus of the parabola.

208 What is the equation of the directrix for the parabola  $-8(y - 3) = (x + 4)^2$ ?

- 1)  $y = 5$
- 2)  $y = 1$
- 3)  $y = -2$
- 4)  $y = -6$

209 Written in simplest form,  $\frac{c^2 - d^2}{d^2 + cd - 2c^2}$  where

$c \neq d$ , is equivalent to

- 1)  $\frac{c + d}{d + 2c}$
- 2)  $\frac{c - d}{d + 2c}$
- 3)  $\frac{-c - d}{d + 2c}$
- 4)  $\frac{-c + d}{d + 2c}$

210 For positive values of  $x$ , which expression is

equivalent to  $\sqrt{16x^2} \cdot x^{\frac{2}{3}} + \sqrt[3]{8x^5}$

- 1)  $6\sqrt[3]{x^5}$
- 2)  $6\sqrt{x^3}$
- 3)  $4\sqrt[3]{x^2} + 2\sqrt[3]{x^5}$
- 4)  $4\sqrt{x^3} + 2\sqrt[5]{x^3}$

211 Which value, to the *nearest tenth*, is *not* a solution of  $p(x) = q(x)$  if  $p(x) = x^3 + 3x^2 - 3x - 1$  and  $q(x) = 3x + 8$ ?

- 1)  $-3.9$
- 2)  $-1.1$
- 3)  $2.1$
- 4)  $4.7$



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212 A manufacturing company has developed a cost model,  $C(x) = 0.15x^3 + 0.01x^2 + 2x + 120$ , where  $x$  is the number of items sold, in thousands. The sales price can be modeled by  $S(x) = 30 - 0.01x$ . Therefore, revenue is modeled by  $R(x) = x \cdot S(x)$ . The company's profit,  $P(x) = R(x) - C(x)$ , could be modeled by

- 1)  $0.15x^3 + 0.02x^2 - 28x + 120$
- 2)  $-0.15x^3 - 0.02x^2 + 28x - 120$
- 3)  $-0.15x^3 + 0.01x^2 - 2.01x - 120$
- 4)  $-0.15x^3 + 32x + 120$

213 The weights of bags of Graseck's Chocolate Candies are normally distributed with a mean of 4.3 ounces and a standard deviation of 0.05 ounces. What is the probability that a bag of these chocolate candies weighs less than 4.27 ounces?

- 1) 0.2257
- 2) 0.2743
- 3) 0.7257
- 4) 0.7757

214 Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of \$21,000 and a \$1000 down payment, to the nearest cent.

$$P_n = PMT \left( \frac{1 - (1 + i)^{-n}}{i} \right)$$

$P_n$  = present amount borrowed

$n$  = number of monthly pay periods

$PMT$  = monthly payment

$i$  = interest rate per month

The affordable monthly payment is \$300 for the same time period. Determine an appropriate down payment, to the nearest dollar.

215 After sitting out of the refrigerator for a while, a turkey at room temperature (68°F) is placed into an oven at 8 a.m., when the oven temperature is 325°F. Newton's Law of Heating explains that the temperature of the turkey will increase proportionally to the difference between the temperature of the turkey and the temperature of the oven, as given by the formula below:

$$T = T_a + (T_0 - T_a)e^{-kt}$$

$T_a$  = the temperature surrounding the object

$T_0$  = the initial temperature of the object

$t$  = the time in hours

$T$  = the temperature of the object after  $t$  hours

$k$  = decay constant

The turkey reaches the temperature of approximately 100° F after 2 hours. Find the value of  $k$ , to the nearest thousandth, and write an equation to determine the temperature of the turkey after  $t$  hours. Determine the Fahrenheit temperature of the turkey, to the nearest degree, at 3 p.m.

216 Last year, the total revenue for Home Style, a national restaurant chain, increased 5.25% over the previous year. If this trend were to continue, which expression could the company's chief financial officer use to approximate their monthly percent increase in revenue? [Let  $m$  represent months.]

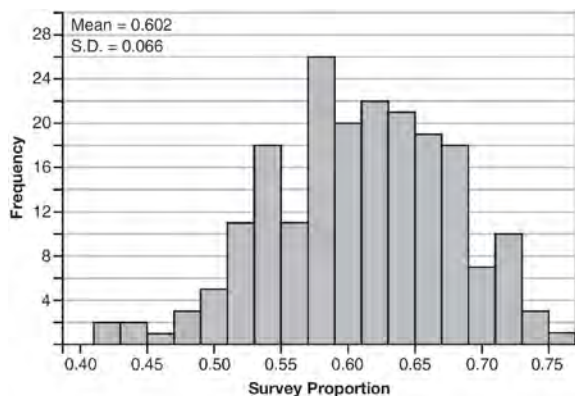
1)  $(1.0525)^m$

2)  $(1.0525)^{\frac{12}{m}}$

3)  $(1.00427)^m$

4)  $(1.00427)^{\frac{m}{12}}$

- 217 Fifty-five students attending the prom were randomly selected to participate in a survey about the music choice at the prom. Sixty percent responded that a DJ would be preferred over a band. Members of the prom committee thought that the vote would have 50% for the DJ and 50% for the band. A simulation was run 200 times, each of sample size 55, based on the premise that 60% of the students would prefer a DJ. The approximate normal simulation results are shown below.



Using the results of the simulation, determine a plausible interval containing the middle 95% of the data. Round all values to the *nearest hundredth*. Members of the prom committee are concerned that a vote of all students attending the prom may produce a 50% – 50% split. Explain what statistical evidence supports this concern.

- 218 Where  $i$  is the imaginary unit, the expression  $(x + 3i)^2 - (2x - 3i)^2$  is equivalent to
- 1)  $-3x^2$
  - 2)  $-3x^2 - 18$
  - 3)  $-3x^2 - 18xi$
  - 4)  $-3x^2 - 6xi - 18$

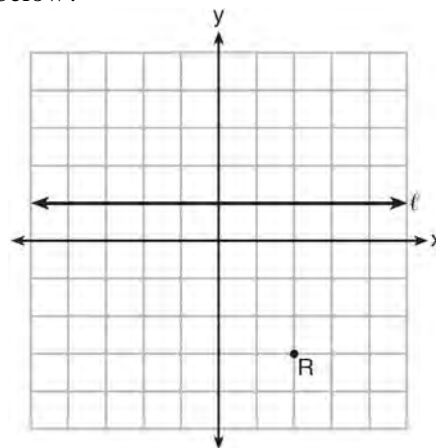
- 219 Jim is looking to buy a vacation home for \$172,600 near his favorite southern beach. The formula to compute a mortgage payment,  $M$ , is

$$M = P \cdot \frac{r(1+r)^N}{(1+r)^N - 1}$$

where  $P$  is the principal

amount of the loan,  $r$  is the monthly interest rate, and  $N$  is the number of monthly payments. Jim's bank offers a monthly interest rate of 0.305% for a 15-year mortgage. With no down payment, determine Jim's mortgage payment, rounded to the *nearest dollar*. Algebraically determine and state the down payment, rounded to the *nearest dollar*, that Jim needs to make in order for his mortgage payment to be \$1100.

- 220 Which equation represents the set of points equidistant from line  $\ell$  and point  $R$  shown on the graph below?



- 1)  $y = -\frac{1}{8}(x + 2)^2 + 1$
- 2)  $y = -\frac{1}{8}(x + 2)^2 - 1$
- 3)  $y = -\frac{1}{8}(x - 2)^2 + 1$
- 4)  $y = -\frac{1}{8}(x - 2)^2 - 1$

221 Which function shown below has a greater average rate of change on the interval  $[-2,4]$ ? Justify your answer.

<b>x</b>	<b>f(x)</b>
-4	0.3125
-3	0.625
-2	1.25
-1	2.5
0	5
1	10
2	20
3	40
4	80
5	160
6	320

$$g(x) = 4x^3 - 5x^2 + 3$$

222 A survey about television-viewing preferences was given to randomly selected freshmen and seniors at Fairport High School. The results are shown in the table below.

<b>Favorite Type of Program</b>			
	<b>Sports</b>	<b>Reality Show</b>	<b>Comedy Series</b>
<b>Senior</b>	83	110	67
<b>Freshmen</b>	119	103	54

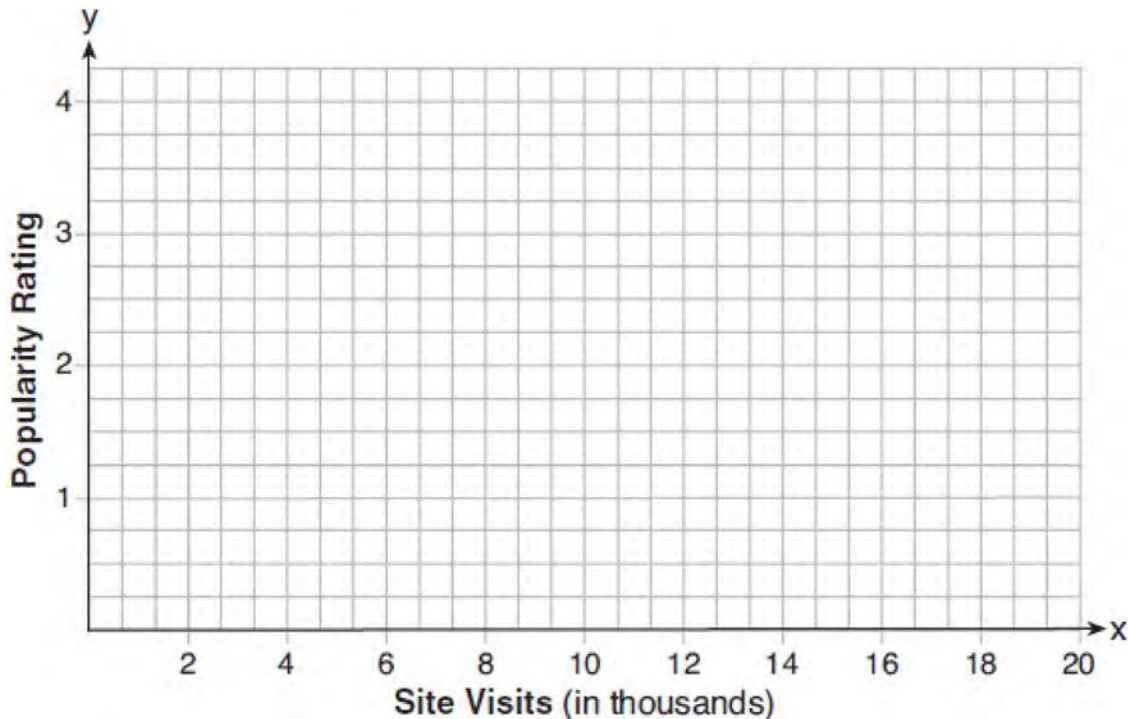
A student response is selected at random from the results. State the *exact* probability the student response is from a freshman, given the student prefers to watch reality shows on television.

223 What is the inverse of  $f(x) = -6(x - 2)$ ?

- 1)  $f^{-1}(x) = -2 - \frac{x}{6}$
- 2)  $f^{-1}(x) = 2 - \frac{x}{6}$
- 3)  $f^{-1}(x) = \frac{1}{-6(x - 2)}$
- 4)  $f^{-1}(x) = 6(x + 2)$

224 Given:  $f(x) = 2x^2 + x - 3$  and  $g(x) = x - 1$   
Express  $f(x) \cdot g(x) - [f(x) + g(x)]$  as a polynomial in standard form.

- 225 Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is  $P(x) = \log(x - 4)$ , where  $x$  is the number of visits per week in thousands and  $P(x)$  is the website's popularity rating. According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*? Graph  $y = P(x)$  on the axes below.



An alternative rating model is represented by  $R(x) = \frac{1}{2}x - 6$ , where  $x$  is the number of visits per week in thousands. Graph  $R(x)$  on the same set of axes. For what number of weekly visits will the two models provide the same rating?

- 226 The guidance department has reported that of the senior class, 2.3% are members of key club,  $K$ , 8.6% are enrolled in AP Physics,  $P$ , and 1.9% are in both. Determine the probability of  $P$  given  $K$ , to the *nearest tenth of a percent*. The principal would like a basic interpretation of these results. Write a statement relating your calculated probabilities to student enrollment in the given situation.

- 227 Which statement is true about the graph of

$$f(x) = \left(\frac{1}{8}\right)^x ?$$

- 1) The graph is always increasing.
- 2) The graph is always decreasing.
- 3) The graph passes through  $(1, 0)$ .
- 4) The graph has an asymptote,  $x = 0$ .

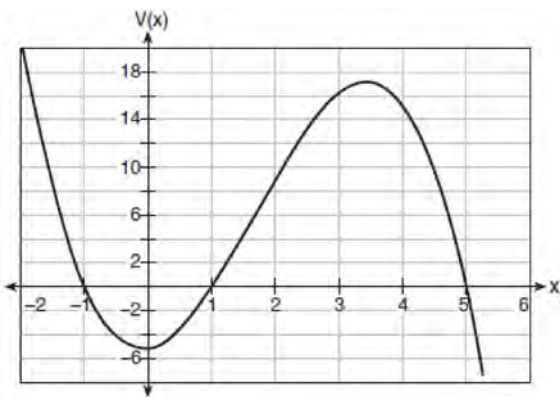
Algebra II Regents Exam Questions at Random

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228 Jasmine decides to put \$100 in a savings account each month. The account pays 3% annual interest, compounded monthly. How much money,  $S$ , will Jasmine have after one year?

- 1)  $S = 100(1.03)^{12}$
- 2)  $S = \frac{100 - 100(1.0025)^{12}}{1 - 1.0025}$
- 3)  $S = 100(1.0025)^{12}$
- 4)  $S = \frac{100 - 100(1.03)^{12}}{1 - 1.03}$

229 A cardboard box manufacturing company is building boxes with length represented by  $x + 1$ , width by  $5 - x$ , and height by  $x - 1$ . The volume of the box is modeled by the function below.



Over which interval is the volume of the box changing at the fastest average rate?

- 1)  $[1, 2]$
- 2)  $[1, 3.5]$
- 3)  $[1, 5]$
- 4)  $[0, 3.5]$

230 Julie averaged 85 on the first three tests of the semester in her mathematics class. If she scores 93 on each of the remaining tests, her average will be 90. Which equation could be used to determine how many tests,  $T$ , are left in the semester?

- 1)  $\frac{255 + 93T}{3T} = 90$
- 2)  $\frac{255 + 90T}{3T} = 93$
- 3)  $\frac{255 + 93T}{T + 3} = 90$
- 4)  $\frac{255 + 90T}{T + 3} = 93$

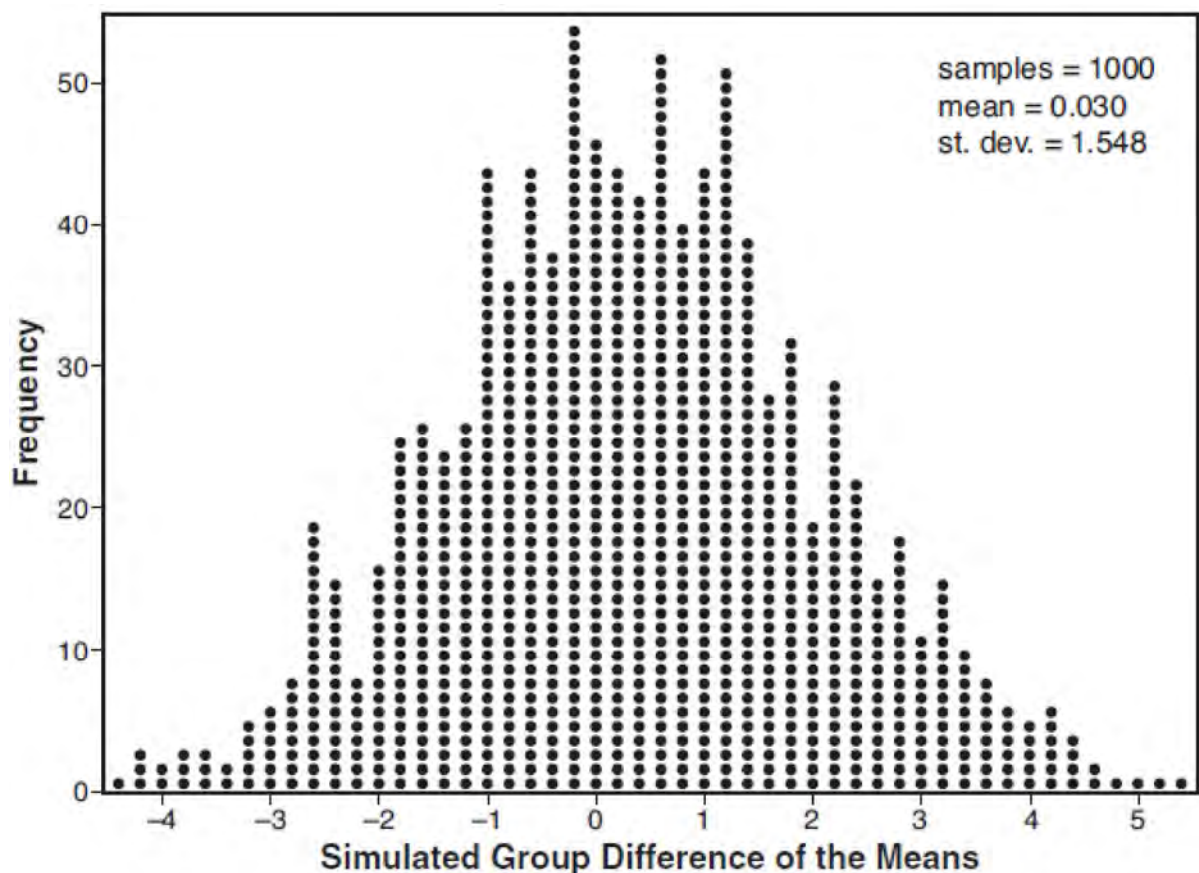
231 On average, college seniors graduating in 2012 could compute their growing student loan debt using the function  $D(t) = 29,400(1.068)^t$ , where  $t$  is time in years. Which expression is equivalent to  $29,400(1.068)^t$  and could be used by students to identify an approximate daily interest rate on their loans?

- 1)  $29,400 \left( 1.068^{\frac{1}{365}} \right)^t$
- 2)  $29,400 \left( \frac{1.068}{365} \right)^{365t}$
- 3)  $29,400 \left( 1 + \frac{0.068}{365} \right)^t$
- 4)  $29,400 \left( 1.068^{\frac{1}{365}} \right)^{365t}$

- 232 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

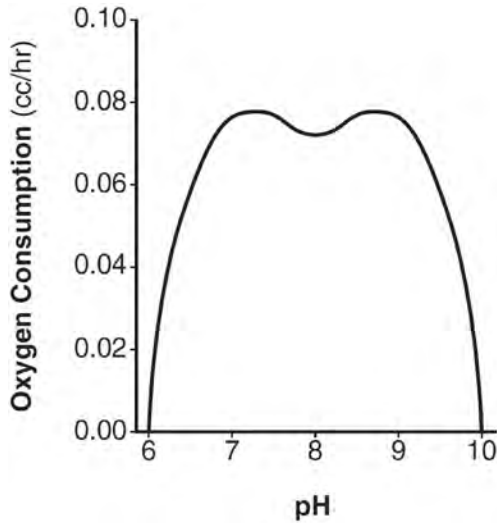
	Scented Paper	Unscented Paper
$\bar{x}$	23	18
$s_x$	2.898	2.408

Calculate the difference in means in the experimental test grades (scented -unscented). A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.



Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the nearest hundredth. Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

- 233 There was a study done on oxygen consumption of snails as a function of pH, and the result was a degree 4 polynomial function whose graph is shown below.



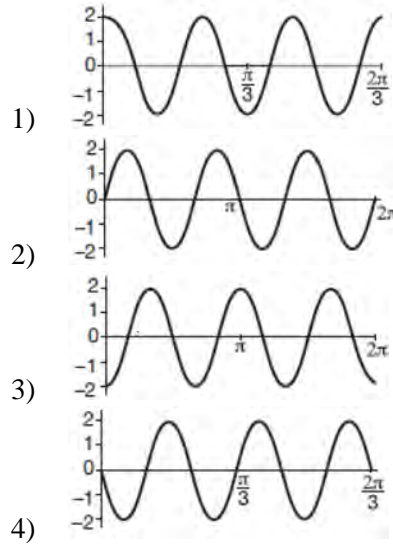
Which statement about this function is *incorrect*?

- 1) The degree of the polynomial is even.
  - 2) There is a positive leading coefficient.
  - 3) At two pH values, there is a relative maximum value.
  - 4) There are two intervals where the function is decreasing.
- 234 Elizabeth tried to find the product of  $(2 + 4i)$  and  $(3 - i)$ , and her work is shown below.

$$\begin{aligned} & (2 + 4i)(3 - i) \\ &= 6 - 2i + 12i - 4i^2 \\ &= 6 + 10i - 4i^2 \\ &= 6 + 10i - 4(1) \\ &= 6 + 10i - 4 \\ &= 2 + 10i \end{aligned}$$

Identify the error in the process shown and determine the correct product of  $(2 + 4i)$  and  $(3 - i)$ .

- 235 Which graph represents a cosine function with no horizontal shift, an amplitude of 2, and a period of  $\frac{2\pi}{3}$ ?



- 236 Given  $f(x) = 3x^2 + 7x - 20$  and  $g(x) = x - 2$ , state the quotient and remainder of  $\frac{f(x)}{g(x)}$ , in the form

$$q(x) + \frac{r(x)}{g(x)}$$

- 237 Sean's team has a baseball game tomorrow. He pitches 50% of the games. There is a 40% chance of rain during the game tomorrow. If the probability that it rains given that Sean pitches is 40%, it can be concluded that these two events are
- 1) independent
  - 2) dependent
  - 3) mutually exclusive
  - 4) complements

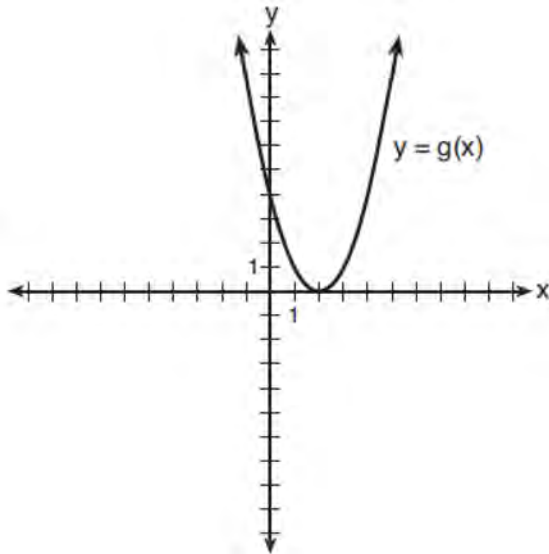
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238 A circle centered at the origin has a radius of 10 units. The terminal side of an angle,  $\theta$ , intercepts the circle in Quadrant II at point  $C$ . The  $y$ -coordinate of point  $C$  is 8. What is the value of  $\cos \theta$ ?

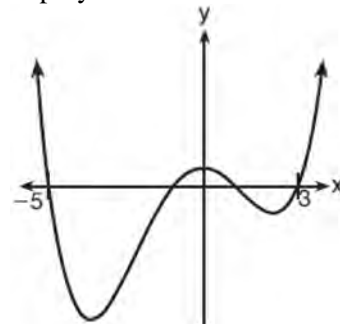
- 1)  $-\frac{3}{5}$
- 2)  $-\frac{3}{4}$
- 3)  $\frac{3}{5}$
- 4)  $\frac{4}{5}$

239 What is the solution to the system of equations  $y = 3x - 2$  and  $y = g(x)$  where  $g(x)$  is defined by the function below?

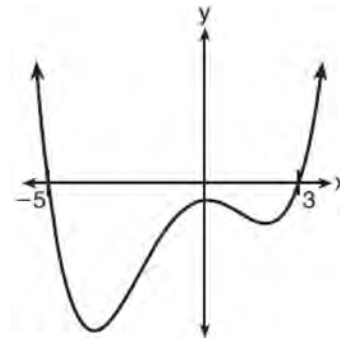


- 1)  $\{(0, -2)\}$
- 2)  $\{(0, -2), (1, 6)\}$
- 3)  $\{(1, 6)\}$
- 4)  $\{(1, 1), (6, 16)\}$

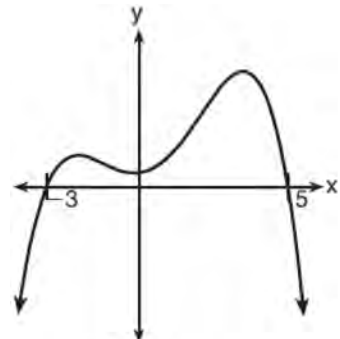
240 A 4th degree polynomial has zeros  $-5, 3, i,$  and  $-i$ . Which graph could represent the function defined by this polynomial?



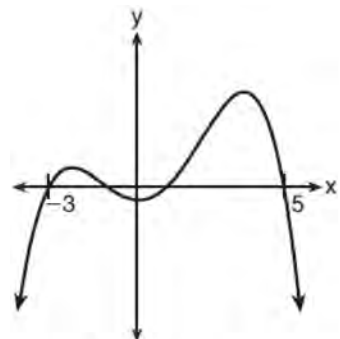
1)



2)



3)



4)



241 Solve algebraically for all values of  $x$ :

$$\sqrt{x-4} + x = 6$$

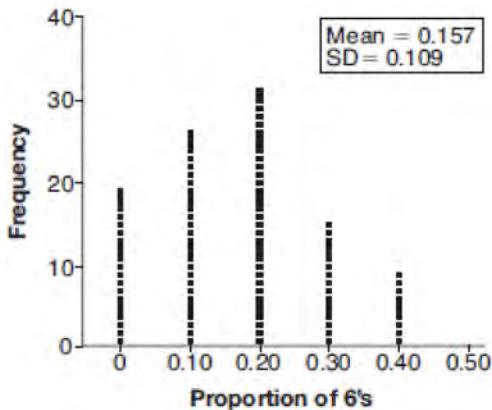
242 Explain why  $81^{\frac{3}{4}}$  equals 27.

243 A game spinner is divided into 6 equally sized regions, as shown in the diagram below.



For Miles to win, the spinner must land on the number 6. After spinning the spinner 10 times, and losing all 10 times, Miles complained that the spinner is unfair. At home, his dad ran 100 simulations of spinning the spinner 10 times, assuming the probability of winning each spin is  $\frac{1}{6}$ .

The output of the simulation is shown in the diagram below.



Which explanation is appropriate for Miles and his dad to make?

- 1) The spinner was likely unfair, since the number 6 failed to occur in about 20% of the simulations.
- 2) The spinner was likely unfair, since the spinner should have landed on the number 6 by the sixth spin.
- 3) The spinner was likely not unfair, since the number 6 failed to occur in about 20% of the simulations.
- 4) The spinner was likely not unfair, since in the output the player wins once or twice in the majority of the simulations.

244 If  $f(x) = 3|x| - 1$  and  $g(x) = 0.03x^3 - x + 1$ , an approximate solution for the equation  $f(x) = g(x)$  is

- 1) 1.96
- 2) 11.29
- 3)  $(-0.99, 1.96)$
- 4)  $(11.29, 32.87)$

245 Relative to the graph of  $y = 3 \sin x$ , what is the shift of the graph of  $y = 3 \sin\left(x + \frac{\pi}{3}\right)$ ?

- 1)  $\frac{\pi}{3}$  right
- 2)  $\frac{\pi}{3}$  left
- 3)  $\frac{\pi}{3}$  up
- 4)  $\frac{\pi}{3}$  down

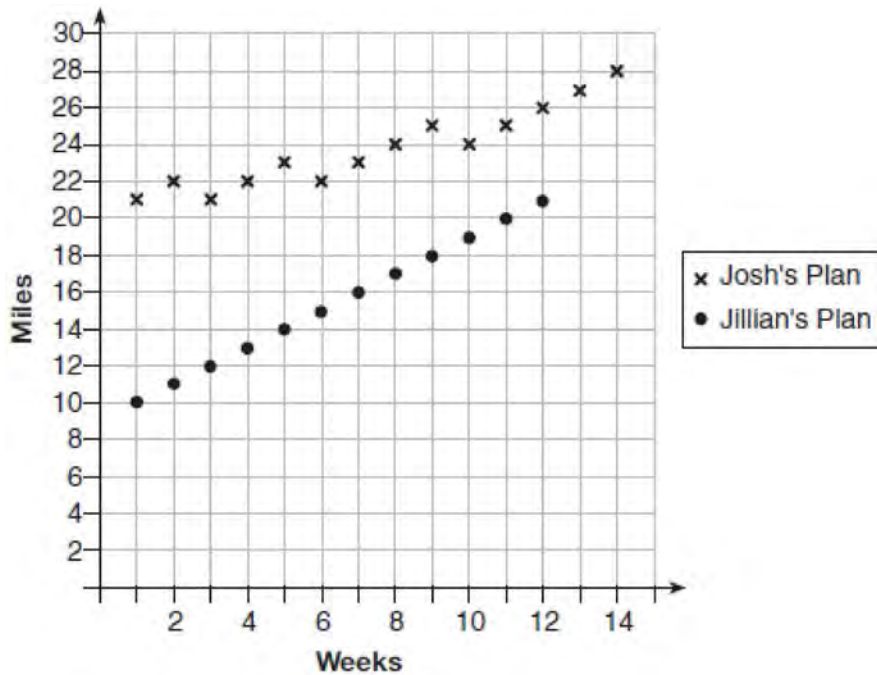
246 Solve algebraically for all values of  $x$ :

$$\sqrt{6-2x} + x = 2(x+15) - 9$$

Algebra II Regents Exam Questions at Random

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247 Elaina has decided to run the Buffalo half-marathon in May. She researched training plans on the Internet and is looking at two possible plans: Jillian's 12-week plan and Josh's 14-week plan. The number of miles run per week for each plan is plotted below.



Which one of the plans follows an arithmetic pattern? Explain how you arrived at your answer. Write a recursive definition to represent the number of miles run each week for the duration of the plan you chose. Jillian's plan has an alternative if Elaina wanted to train instead for a full 26-mile marathon. Week one would start at 13 miles and follow the same pattern for the half-marathon, but it would continue for 14 weeks. Write an explicit formula, in *simplest form*, to represent the number of miles run each week for the full-marathon training plan.

248 What is the inverse of  $f(x) = x^3 - 2$ ?

- 1)  $f^{-1}(x) = \sqrt[3]{x} + 2$
- 2)  $f^{-1}(x) = \pm\sqrt[3]{x} + 2$
- 3)  $f^{-1}(x) = \sqrt[3]{x+2}$
- 4)  $f^{-1}(x) = \pm\sqrt[3]{x+2}$

249 If the function  $g(x) = ab^x$  represents exponential growth, which statement about  $g(x)$  is *false*?

- 1)  $a > 0$  and  $b > 1$
- 2) The y-intercept is  $(0, a)$ .
- 3) The asymptote is  $y = 0$ .
- 4) The x-intercept is  $(b, 0)$ .

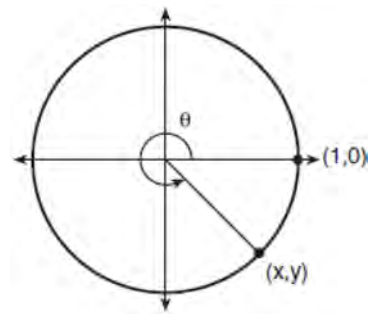
Algebra II Regents Exam Questions at Random

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- 250 Which expression can be rewritten as  $(x + 7)(x - 1)$ ?
- 1)  $(x + 3)^2 - 16$
  - 2)  $(x + 3)^2 - 10(x + 3) - 2(x + 3) + 20$
  - 3)  $\frac{(x - 1)(x^2 - 6x - 7)}{(x + 1)}$
  - 4)  $\frac{(x + 7)(x^2 + 4x + 3)}{(x + 3)}$
- 251 Alexa earns \$33,000 in her first year of teaching and earns a 4% increase in each successive year. Write a geometric series formula,  $S_n$ , for Alexa's total earnings over  $n$  years. Use this formula to find Alexa's total earnings for her first 15 years of teaching, to the *nearest cent*.
- 252 The weight of a bag of pears at the local market averages 8 pounds with a standard deviation of 0.5 pound. The weights of all the bags of pears at the market closely follow a normal distribution. Determine what percentage of bags, to the *nearest integer*, weighed *less* than 8.25 pounds.
- 253 The eighth and tenth terms of a sequence are 64 and 100. If the sequence is either arithmetic or geometric, the ninth term can *not* be
- 1) -82
  - 2) -80
  - 3) 80
  - 4) 82

- 254 The solution to the equation  $18x^2 - 24x + 87 = 0$  is
- 1)  $-\frac{2}{3} \pm 6i\sqrt{158}$
  - 2)  $-\frac{2}{3} \pm \frac{1}{6}i\sqrt{158}$
  - 3)  $\frac{2}{3} \pm 6i\sqrt{158}$
  - 4)  $\frac{2}{3} \pm \frac{1}{6}i\sqrt{158}$

- 255 Using the unit circle below, explain why  $\csc \theta = \frac{1}{y}$ .



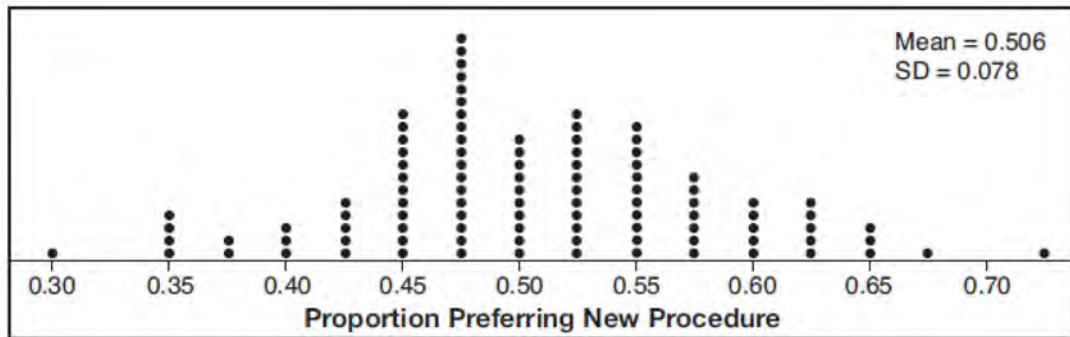
- 256 What is the quotient when  $10x^3 - 3x^2 - 7x + 3$  is divided by  $2x - 1$ ?
- 1)  $5x^2 + x + 3$
  - 2)  $5x^2 - x + 3$
  - 3)  $5x^2 - x - 3$
  - 4)  $5x^2 + x - 3$

Algebra II Regents Exam Questions at Random

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- 257 The function  $p(t) = 110e^{0.03922t}$  models the population of a city, in millions,  $t$  years after 2010. As of today, consider the following two statements:
- The current population is 110 million.
  - The population increases continuously by approximately 3.9% per year.
- This model supports
- I, only
  - II, only
  - both I and II
  - neither I nor II
- 258 The expression  $(x + a)(x + b)$  can *not* be written as
- $a(x + b) + x(x + b)$
  - $x^2 + abx + ab$
  - $x^2 + (a + b)x + ab$
  - $x(x + a) + b(x + a)$
- 259 Given  $f^{-1}(x) = -\frac{3}{4}x + 2$ , which equation represents  $f(x)$ ?
- $f(x) = \frac{4}{3}x - \frac{8}{3}$
  - $f(x) = -\frac{4}{3}x + \frac{8}{3}$
  - $f(x) = \frac{3}{4}x - 2$
  - $f(x) = -\frac{3}{4}x + 2$
- 260 What is the solution to  $8(2^{x+3}) = 48$ ?
- $x = \frac{\ln 6}{\ln 2} - 3$
  - $x = 0$
  - $x = \frac{\ln 48}{\ln 16} - 3$
  - $x = \ln 4 - 3$
- 261 Determine if  $x - 5$  is a factor of  $2x^3 - 4x^2 - 7x - 10$ . Explain your answer.
- 262 Cheap and Fast gas station is conducting a consumer satisfaction survey. Which method of collecting data would most likely lead to a biased sample?
- interviewing every 5th customer to come into the station
  - interviewing customers chosen at random by a computer at the checkout
  - interviewing customers who call an 800 number posted on the customers' receipts
  - interviewing every customer who comes into the station on a day of the week chosen at random out of a hat
- 263 The voltage used by most households can be modeled by a sine function. The maximum voltage is 120 volts, and there are 60 cycles *every second*. Which equation best represents the value of the voltage as it flows through the electric wires, where  $t$  is time in seconds?
- $V = 120 \sin(t)$
  - $V = 120 \sin(60t)$
  - $V = 120 \sin(60\pi t)$
  - $V = 120 \sin(120\pi t)$
- 264 Algebraically prove that  $\frac{x^3 + 9}{x^3 + 8} = 1 + \frac{1}{x^3 + 8}$ , where  $x \neq -2$ .

- 265 Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.



Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*. Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

- 266 The expression  $\frac{4x^3 + 5x + 10}{2x + 3}$  is equivalent to

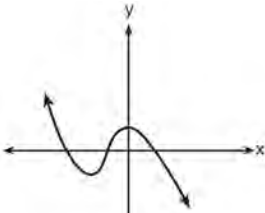
- 1)  $2x^2 + 3x - 7 + \frac{31}{2x + 3}$
- 2)  $2x^2 - 3x + 7 - \frac{11}{2x + 3}$
- 3)  $2x^2 + 2.5x + 5 + \frac{15}{2x + 3}$
- 4)  $2x^2 - 2.5x - 5 - \frac{20}{2x + 3}$

- 267 Solve the equation  $2x^2 + 5x + 8 = 0$ . Express the answer in  $a + bi$  form.

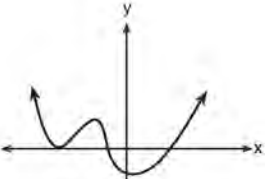
- 268 The half-life of iodine-131 is 8 days. The percent of the isotope left in the body  $d$  days after being introduced is  $I = 100\left(\frac{1}{2}\right)^{\frac{d}{8}}$ . When this equation is written in terms of the number  $e$ , the base of the natural logarithm, it is equivalent to  $I = 100e^{kd}$ . What is the approximate value of the constant,  $k$ ?
- 1)  $-0.087$
  - 2)  $0.087$
  - 3)  $-11.542$
  - 4)  $11.542$

269 Which graph has the following characteristics?

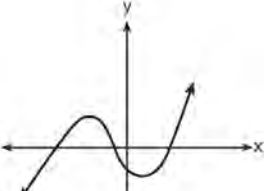
- three real zeros
- as  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$
- as  $x \rightarrow \infty$ ,  $f(x) \rightarrow \infty$



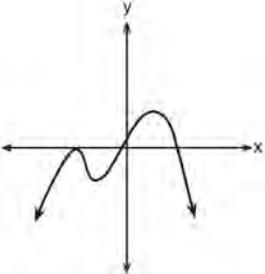
1)



2)



3)



4)

270 Algebraically determine the values of  $h$  and  $k$  to correctly complete the identity stated below.

$$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$

271 A suburban high school has a population of 1376 students. The number of students who participate in sports is 649. The number of students who participate in music is 433. If the probability that a student participates in either sports or music is  $\frac{974}{1376}$ , what is the probability that a student participates in both sports and music?

272 What is the solution, if any, of the equation

$$\frac{2}{x+3} - \frac{3}{4-x} = \frac{2x-2}{x^2-x-12}?$$

- 1)  $-1$
- 2)  $-5$
- 3) all real numbers
- 4) no real solution

273 Completely factor the following expression:

$$x^2 + 3xy + 3x^3 + y$$

274 The function  $M(t)$  represents the mass of radium over time,  $t$ , in years.

$$M(t) = 100e^{\frac{\left(\ln \frac{1}{2}\right)t}{1590}}$$

Determine if the function  $M(t)$  represents growth or decay. Explain your reasoning.

Algebra II Regents Exam Questions at Random

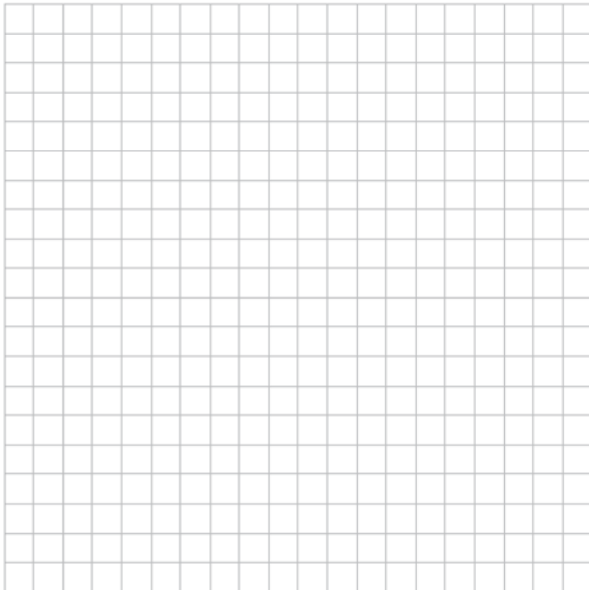
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- 275 The results of a survey of the student body at Central High School about television viewing preferences are shown below.

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Are the events “student is a male” and “student prefers reality series” independent of each other? Justify your answer.

- 276 On the grid below, sketch a cubic polynomial whose zeros are 1, 3, and -2.



- 278 Given  $r(x) = x^3 - 4x^2 + 4x - 6$ , find the value of  $r(2)$ . What does your answer tell you about  $x - 2$  as a factor of  $r(x)$ ? Explain.

- 279 The function  $N(t) = 100e^{-0.023t}$  models the number of grams in a sample of cesium-137 that remain after  $t$  years. On which interval is the sample's average rate of decay the fastest?
- 1) [1, 10]
  - 2) [10, 20]
  - 3) [15, 25]
  - 4) [1, 30]

- 280 Solve the following system of equations algebraically for all values of  $x$ ,  $y$ , and  $z$ :

$$x + y + z = 1$$

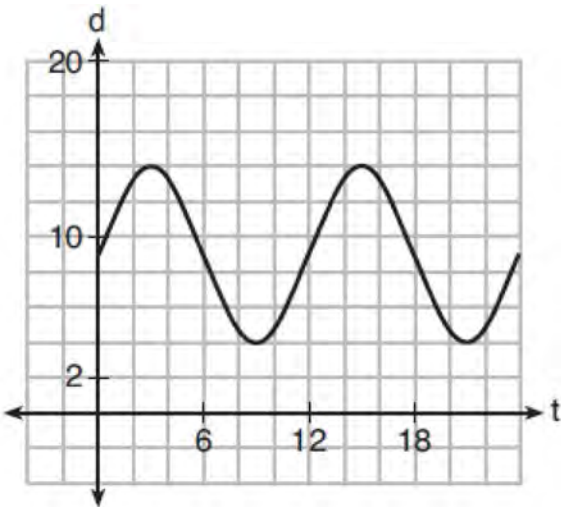
$$2x + 4y + 6z = 2$$

$$-x + 3y - 5z = 11$$

- 277 Given the equal terms  $\sqrt[3]{x^5}$  and  $y^{\frac{5}{6}}$ , determine and state  $y$ , in terms of  $x$ .

281 Describe how a controlled experiment can be created to examine the effect of ingredient  $X$  in a toothpaste.

282 The depth of the water at a marker 20 feet from the shore in a bay is depicted in the graph below.



If the depth,  $d$ , is measured in feet and time,  $t$ , is measured in hours since midnight, what is an equation for the depth of the water at the marker?

- 1)  $d = 5 \cos\left(\frac{\pi}{6} t\right) + 9$
- 2)  $d = 9 \cos\left(\frac{\pi}{6} t\right) + 5$
- 3)  $d = 9 \sin\left(\frac{\pi}{6} t\right) + 5$
- 4)  $d = 5 \sin\left(\frac{\pi}{6} t\right) + 9$

283 What is the solution set of the equation

$$\frac{2}{x} - \frac{3x}{x+3} = \frac{x}{x+3}?$$

- 1)  $\{3\}$
- 2)  $\left\{\frac{3}{2}\right\}$
- 3)  $\{-2, 3\}$
- 4)  $\left\{-1, \frac{3}{2}\right\}$

284 The set of data in the table below shows the results of a survey on the number of messages that people of different ages text on their cell phones each month.

Age Group	Text Messages per Month		
	0–10	11–50	Over 50
15–18	4	37	68
19–22	6	25	87
23–60	25	47	157

If a person from this survey is selected at random, what is the probability that the person texts over 50 messages per month given that the person is between the ages of 23 and 60?

- 1)  $\frac{157}{229}$
- 2)  $\frac{157}{312}$
- 3)  $\frac{157}{384}$
- 4)  $\frac{157}{456}$



Algebra II Regents Exam Questions at Random

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- 285 The populations of two small towns at the beginning of 2018 and their annual population growth rate are shown in the table below.

Town	Population	Annual Population Growth Rate
Jonesville	1240	6% increase
Williamstown	890	11% increase

Assuming the trend continues, approximately how many years after the beginning of 2018 will it take for the populations to be equal?

- 1) 7  
2) 20  
3) 68  
4) 125
- 286 Given the following polynomials

$$x = (a + b + c)^2$$

$$y = a^2 + b^2 + c^2$$

$$z = ab + bc + ac$$

Which identity is true?

- 1)  $x = y - z$   
2)  $x = y + z$   
3)  $x = y - 2z$   
4)  $x = y + 2z$

- 288 For the system shown below, what is the value of  $z$ ?

$$y = -2x + 14$$

$$3x - 4z = 2$$

$$3x - y = 16$$

- 1) 5  
2) 2  
3) 6  
4) 4

- 287 The function  $f(x) = 2^{-0.25x} \cdot \sin\left(\frac{\pi}{2}x\right)$  represents a damped sound wave function. What is the average rate of change for this function on the interval  $[-7, 7]$ , to the nearest hundredth?

- 1) -3.66  
2) -0.30  
3) -0.26  
4) 3.36

- 289 If  $p(x) = ab^x$  and  $r(x) = cd^x$ , then  $p(x) \cdot r(x)$  equals

- 1)  $ac(b + d)^x$   
2)  $ac(b + d)^{2x}$   
3)  $ac(bd)^x$   
4)  $ac(bd)^{x^2}$

Algebra II Regents Exam Questions at Random

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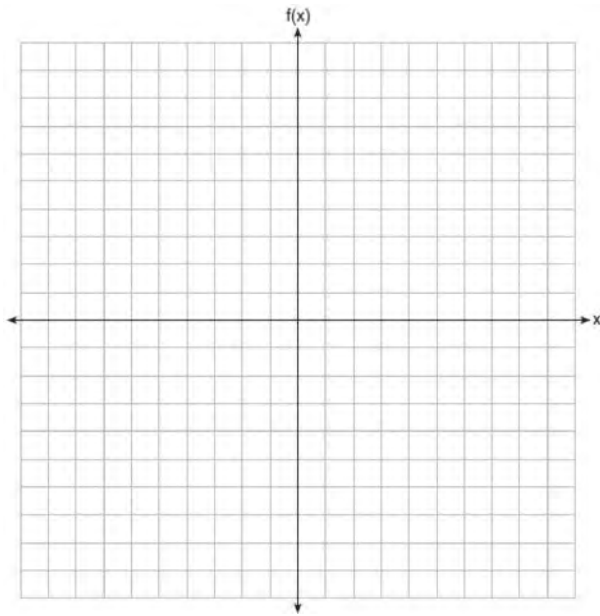
- 290 Joelle has a credit card that has a 19.2% annual interest rate compounded monthly. She owes a total balance of  $B$  dollars after  $m$  months. Assuming she makes no payments on her account, the table below illustrates the balance she owes after  $m$  months.

<b>m</b>	<b>B</b>
0	100.00
10	1172.00
19	1352.00
36	1770.80
60	2591.90
69	2990.00
72	3135.80
73	3186.00

Over which interval of time is her average rate of change for the balance on her credit card account the greatest?

- 1) month 10 to month 60  
 2) month 19 to month 69  
 3) month 36 to month 72  
 4) month 60 to month 73
- 291 A parabola has its focus at  $(1,2)$  and its directrix is  $y = -2$ . The equation of this parabola could be
- 1)  $y = 8(x + 1)^2$   
 2)  $y = \frac{1}{8}(x + 1)^2$   
 3)  $y = 8(x - 1)^2$   
 4)  $y = \frac{1}{8}(x - 1)^2$
- 292 The heights of women in the United States are normally distributed with a mean of 64 inches and a standard deviation of 2.75 inches. The percent of women whose heights are between 64 and 69.5 inches, to the *nearest whole percent*, is
- 1) 6  
 2) 48  
 3) 68  
 4) 95
- 293 The terminal side of  $\theta$ , an angle in standard position, intersects the unit circle at  $P\left(-\frac{1}{3}, -\frac{\sqrt{8}}{3}\right)$ .  
 What is the value of  $\sec \theta$ ?
- 1)  $-3$   
 2)  $-\frac{3\sqrt{8}}{8}$   
 3)  $-\frac{1}{3}$   
 4)  $-\frac{\sqrt{8}}{3}$
- 294 Which function is even?
- 1)  $f(x) = \sin x$   
 2)  $f(x) = x^2 - 4$   
 3)  $f(x) = |x - 2| + 5$   
 4)  $f(x) = x^4 + 3x^3 + 4$

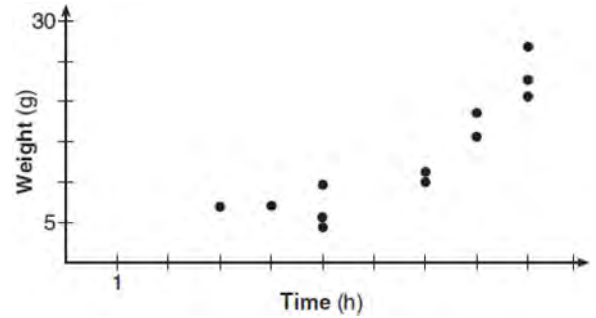
- 295 On the grid below, graph the function  
 $f(x) = x^3 - 6x^2 + 9x + 6$  on the domain  $-1 \leq x \leq 4$ .



- 296 A manufacturing plant produces two different-sized containers of peanuts. One container weighs  $x$  ounces and the other weighs  $y$  pounds. If a gift set can hold one of each size container, which expression represents the number of gift sets needed to hold 124 ounces?

- 1)  $\frac{124}{16x + y}$
- 2)  $\frac{x + 16y}{124}$
- 3)  $\frac{124}{x + 16y}$
- 4)  $\frac{16x + y}{124}$

- 297 A scatterplot showing the weight,  $w$ , in grams, of each crystal after growing  $t$  hours is shown below.

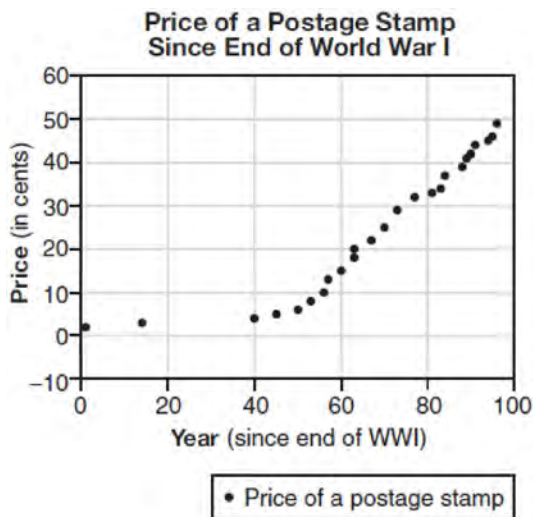


The relationship between weight,  $w$ , and time,  $t$ , is best modeled by

- 1)  $w = 4^t + 5$
  - 2)  $w = (1.4)^t + 2$
  - 3)  $w = 5(2.1)^t$
  - 4)  $w = 8(.75)^t$
- 298 The solutions to  $x + 3 - \frac{4}{x-1} = 5$  are

- 1)  $\frac{3}{2} \pm \frac{\sqrt{17}}{2}$
- 2)  $\frac{3}{2} \pm \frac{\sqrt{17}}{2} i$
- 3)  $\frac{3}{2} \pm \frac{\sqrt{33}}{2}$
- 4)  $\frac{3}{2} \pm \frac{\sqrt{33}}{2} i$

- 299 The price of a postage stamp in the years since the end of World War I is shown in the scatterplot below.



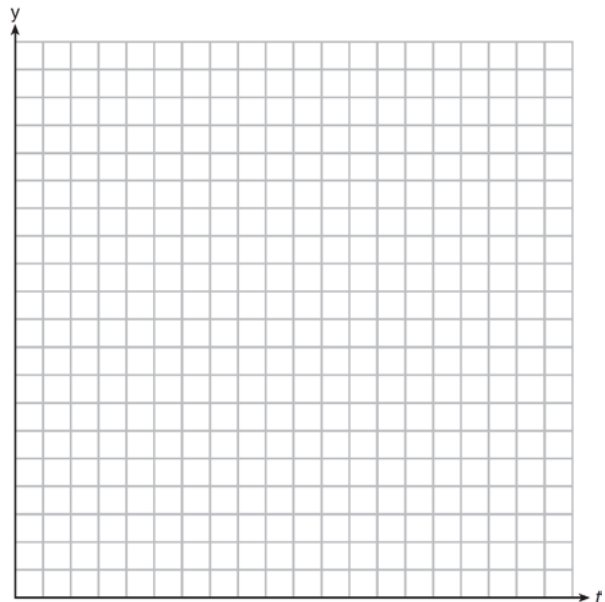
The equation that best models the price, in cents, of a postage stamp based on these data is

- 1)  $y = 0.59x - 14.82$
  - 2)  $y = 1.04(1.43)^x$
  - 3)  $y = 1.43(1.04)^x$
  - 4)  $y = 24 \sin(14x) + 25$
- 300 To solve  $\frac{2x}{x-2} - \frac{11}{x} = \frac{8}{x^2 - 2x}$ , Ren multiplied

both sides by the least common denominator. Which statement is true?

- 1) 2 is an extraneous solution.
- 2)  $\frac{7}{2}$  is an extraneous solution.
- 3) 0 and 2 are extraneous solutions.
- 4) This equation does not contain any extraneous solutions.

- 301 Drugs break down in the human body at different rates and therefore must be prescribed by doctors carefully to prevent complications, such as overdosing. The breakdown of a drug is represented by the function  $N(t) = N_0(e)^{-rt}$ , where  $N(t)$  is the amount left in the body,  $N_0$  is the initial dosage,  $r$  is the decay rate, and  $t$  is time in hours. Patient A,  $A(t)$ , is given 800 milligrams of a drug with a decay rate of 0.347. Patient B,  $B(t)$ , is given 400 milligrams of another drug with a decay rate of 0.231. Write two functions,  $A(t)$  and  $B(t)$ , to represent the breakdown of the respective drug given to each patient. Graph each function on the set of axes below.



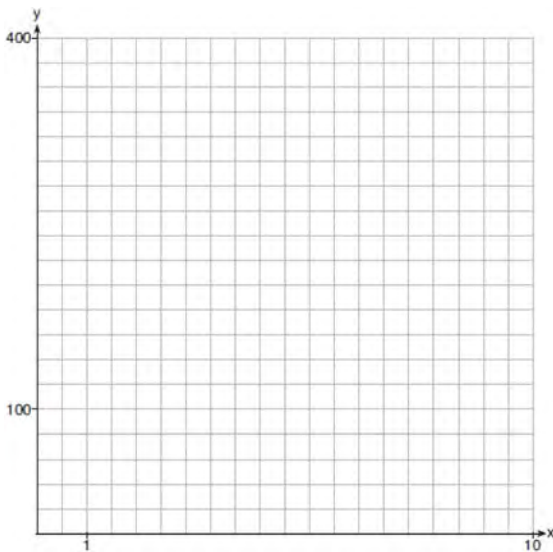
To the *nearest hour*,  $t$ , when does the amount of the given drug remaining in patient B begin to exceed the amount of the given drug remaining in patient A? The doctor will allow patient A to take another 800 milligram dose of the drug once only 15% of the original dose is left in the body. Determine, to the *nearest tenth of an hour*, how long patient A will have to wait to take another 800 milligram dose of the drug.

302 Data collected about jogging from students with two older siblings are shown in the table below.

	Neither Sibling Jogs	One Sibling Jogs	Both Siblings Jog
Student Does Not Jog	1168	1823	1380
Student Jogs	188	416	400

Using these data, determine whether a student with two older siblings is more likely to jog if one sibling jogs or if both siblings jog. Justify your answer.

303 Graph  $y = 400(.85)^{2x} - 6$  on the set of axes below.



304 The zeros for  $f(x) = x^4 - 4x^3 - 9x^2 + 36x$  are

- 1)  $\{0, \pm 3, 4\}$
- 2)  $\{0, 3, 4\}$
- 3)  $\{0, \pm 3, -4\}$
- 4)  $\{0, 3, -4\}$

305 Based on climate data that have been collected in Bar Harbor, Maine, the average monthly temperature, in degrees F, can be modeled by the equation

$B(x) = 23.914 \sin(0.508x - 2.116) + 55.300$ . The same governmental agency collected average monthly temperature data for Phoenix, Arizona, and found the temperatures could be modeled by the equation

$P(x) = 20.238 \sin(0.525x - 2.148) + 86.729$ . Which statement can *not* be concluded based on the average monthly temperature models  $x$  months after starting data collection?

- 1) The average monthly temperature variation is more in Bar Harbor than in Phoenix.
- 2) The midline average monthly temperature for Bar Harbor is lower than the midline temperature for Phoenix.
- 3) The maximum average monthly temperature for Bar Harbor is  $79^\circ$  F, to the nearest degree.
- 4) The minimum average monthly temperature for Phoenix is  $20^\circ$  F, to the nearest degree.

306 If  $x - 1$  is a factor of  $x^3 - kx^2 + 2x$ , what is the value of  $k$ ?

- 1) 0
- 2) 2
- 3) 3
- 4) -3

Algebra II Regents Exam Questions at Random

[www.jmap.org](http://www.jmap.org)

- 307 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form  $A = A_0 \left(\frac{1}{2}\right)^{\frac{t}{h}}$  that models this situation, where  $h$  is the constant representing the number of hours in the half-life,  $A_0$  is the initial mass, and  $A$  is the mass  $t$  hours after 3 p.m. Using this equation, solve for  $h$ , to the *nearest ten thousandth*. Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.
- 308 The expression  $6xi^3(-4xi + 5)$  is equivalent to
- 1)  $2x - 5i$
  - 2)  $-24x^2 - 30xi$
  - 3)  $-24x^2 + 30x - i$
  - 4)  $26x - 24x^2i - 5i$
- 309 Which equation represents a parabola with a focus of  $(-2, 5)$  and a directrix of  $y = 9$ ?
- 1)  $(y - 7)^2 = 8(x + 2)$
  - 2)  $(y - 7)^2 = -8(x + 2)$
  - 3)  $(x + 2)^2 = 8(y - 7)$
  - 4)  $(x + 2)^2 = -8(y - 7)$
- 310 Given the parent function  $p(x) = \cos x$ , which phrase best describes the transformation used to obtain the graph of  $g(x) = \cos(x + a) - b$ , if  $a$  and  $b$  are positive constants?
- 1) right  $a$  units, up  $b$  units
  - 2) right  $a$  units, down  $b$  units
  - 3) left  $a$  units, up  $b$  units
  - 4) left  $a$  units, down  $b$  units
- 311 An angle,  $\theta$ , is in standard position and its terminal side passes through the point  $(2, -1)$ . Find the *exact* value of  $\sin \theta$ .
- 312 The operator of the local mall wants to find out how many of the mall's employees make purchases in the food court when they are working. She hopes to use these data to increase the rent and attract new food vendors. In total, there are 1023 employees who work at the mall. The best method to obtain a random sample of the employees would be to survey
- 1) all 170 employees at each of the larger stores
  - 2) 50% of the 90 employees of the food court
  - 3) every employee
  - 4) every 30th employee entering each mall entrance for one week
- 313 Given  $i$  is the imaginary unit,  $(2 - yi)^2$  in simplest form is
- 1)  $y^2 - 4yi + 4$
  - 2)  $-y^2 - 4yi + 4$
  - 3)  $-y^2 + 4$
  - 4)  $y^2 + 4$
- 314 Determine the quotient and remainder when  $(6a^3 + 11a^2 - 4a - 9)$  is divided by  $(3a - 2)$ . Express your answer in the form  $q(a) + \frac{r(a)}{d(a)}$ .

Algebra II Regents Exam Questions at Random

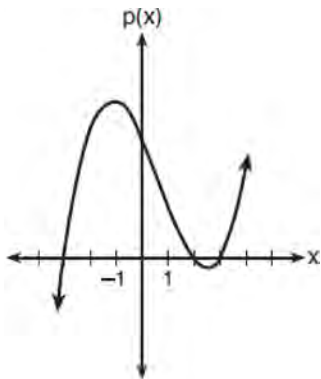
[www.jmap.org](http://www.jmap.org)

315 When  $g(x)$  is divided by  $x + 4$ , the remainder is 0.

Given  $g(x) = x^4 + 3x^3 - 6x^2 - 6x + 8$ , which conclusion about  $g(x)$  is true?

- 1)  $g(4) = 0$
- 2)  $g(-4) = 0$
- 3)  $x - 4$  is a factor of  $g(x)$ .
- 4) No conclusion can be made regarding  $g(x)$ .

316 The graph of the function  $p(x)$  is sketched below.



Which equation could represent  $p(x)$ ?

- 1)  $p(x) = (x^2 - 9)(x - 2)$
- 2)  $p(x) = x^3 - 2x^2 + 9x + 18$
- 3)  $p(x) = (x^2 + 9)(x - 2)$
- 4)  $p(x) = x^3 + 2x^2 - 9x - 18$

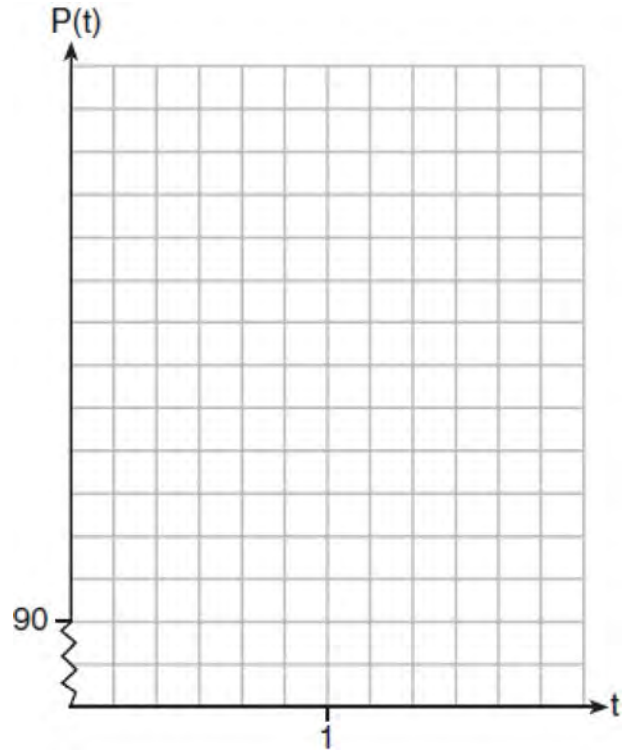
317 When  $g(x) = \frac{2}{x+2}$  and  $h(x) = \log(x+1) + 3$  are graphed on the same set of axes, which coordinates best approximate their point of intersection?

- 1)  $(-0.9, 1.8)$
- 2)  $(-0.9, 1.9)$
- 3)  $(1.4, 3.3)$
- 4)  $(1.4, 3.4)$

318 The resting blood pressure of an adult patient can be modeled by the function  $P$  below, where  $P(t)$  is the pressure in millimeters of mercury after time  $t$  in seconds.

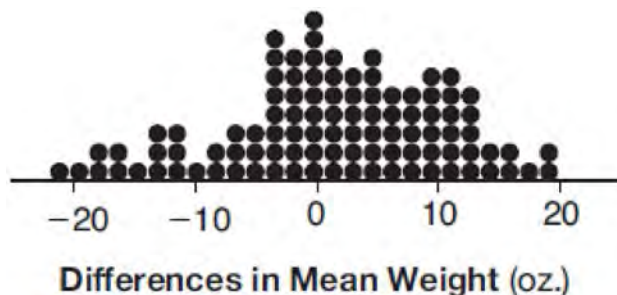
$$P(t) = 24 \cos(3\pi t) + 120$$

On the set of axes below, graph  $y = P(t)$  over the domain  $0 \leq t \leq 2$ .



Determine the period of  $P$ . Explain what this value represents in the given context. Normal resting blood pressure for an adult is 120 over 80. This means that the blood pressure oscillates between a maximum of 120 and a minimum of 80. Adults with high blood pressure (above 140 over 90) and adults with low blood pressure (below 90 over 60) may be at risk for health disorders. Classify the given patient's blood pressure as low, normal, or high and explain your reasoning.

- 319 Gabriel performed an experiment to see if planting 13 tomato plants in black plastic mulch leads to larger tomatoes than if 13 plants are planted without mulch. He observed that the average weight of the tomatoes from tomato plants grown in black plastic mulch was 5 ounces greater than those from the plants planted without mulch. To determine if the observed difference is statistically significant, he rerandomized the tomato groups 100 times to study these random differences in the mean weights. The output of his simulation is summarized in the dotplot below.



Given these results, what is an appropriate inference that can be drawn?

- |   |   |
|---|---|
| <p>1) There was no effect observed between the two groups.</p> <p>2) There was an effect observed that could be due to the random assignment of plants to the groups.</p> | <p>3) There is strong evidence to support the hypothesis that tomatoes from plants planted in black plastic mulch are larger than those planted without mulch.</p> <p>4) There is strong evidence to support the hypothesis that tomatoes from plants planted without mulch are larger than those planted in black plastic mulch.</p> |
|---|---|
- 
- 320 The function below models the average price of gas in a small town since January 1st.
- $$G(t) = -0.0049t^4 + 0.0923t^3 - 0.56t^2 + 1.166t + 3.23,$$
- where  $0 \leq t \leq 10$ .  
 If  $G(t)$  is the average price of gas in dollars and  $t$  represents the number of months since January 1st, the absolute maximum  $G(t)$  reaches over the given domain is about
- 1) \$1.60
  - 2) \$3.92
  - 3) \$4.01
  - 4) \$7.73
- 321 What is the solution set for  $x$  in the equation below?
- $$\sqrt{x+1} - 1 = x$$
- 1) {1}
  - 2) {0}
  - 3) {-1, 0}
  - 4) {0, 1}
- 322 Solve for  $x$ :  $\frac{1}{x} - \frac{1}{3} = -\frac{1}{3x}$



Algebra II Regents Exam Questions at Random

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- 323 Which statement about statistical analysis is *false*?
- 1) Experiments can suggest patterns and relationships in data.
  - 2) Experiments can determine cause and effect relationships.
  - 3) Observational studies can determine cause and effect relationships.
  - 4) Observational studies can suggest patterns and relationships in data.

- 324 For which values of  $x$ , rounded to the *nearest hundredth*, will  $|x^2 - 9| - 3 = \log_3 x$ ?
- 1) 2.29 and 3.63
  - 2) 2.37 and 3.54
  - 3) 2.84 and 3.17
  - 4) 2.92 and 3.06

- 325 Over the set of integers, factor the expression  $4x^3 - x^2 + 16x - 4$  completely.

- 326 Pedro and Bobby each own an ant farm. Pedro starts with 100 ants and says his farm is growing exponentially at a rate of 15% per month. Bobby starts with 350 ants and says his farm is steadily decreasing by 5 ants per month. Assuming both boys are accurate in describing the population of their ant farms, after how many months will they both have approximately the same number of ants?
- 1) 7
  - 2) 8
  - 3) 13
  - 4) 36

- 327 The population of Jamesburg for the years 2010-2013, respectively, was reported as follows: 250,000 250,937 251,878 252,822

How can this sequence be recursively modeled?

1)  $j_n = 250,000(1.00375)^{n-1}$

2)  $j_n = 250,000 + 937^{(n-1)}$

3)  $j_1 = 250,000$

$$j_n = 1.00375j_{n-1}$$

4)  $j_1 = 250,000$

$$j_n = j_{n-1} + 937$$

## Algebra II Regents at Random Answer Section

1 ANS: 4                      PTS: 2                      REF: 081824aai                      NAT: S.CP.A.3  
TOP: Conditional Probability

2 ANS: 2

Combining (1) and (3):  $-6c = -18$     Combining (1) and (2):  $5a + 3c = -1$     Using (3):  $-(-2) - 5b - 5(3) = 2$   
 $c = 3$      $5a + 3(3) = -1$      $2 - 5b - 15 = 2$   
 $5a = -10$      $b = -3$   
 $a = -2$

PTS: 2                      REF: 081623aai                      NAT: A.REI.C.6                      TOP: Solving Linear Systems  
KEY: three variables

3 ANS: 3

$$\begin{array}{r}
 2x^3 - 4x^2 - x + \frac{14}{x+6} \\
 \hline
 x+6 \overline{) 2x^4 + 8x^3 - 25x^2 - 6x + 14} \\
 \underline{2x^4 + 12x^3} \\
 -4x^3 - 25x^2 \\
 \underline{-4x^3 - 24x^2} \\
 -x^2 - 6x \\
 \underline{-x^2 - 6x} \\
 14
 \end{array}$$

PTS: 2                      REF: 081805aai                      NAT: A.APR.D.6                      TOP: Rational Expressions  
KEY: division

4 ANS:  
 $1200 \cdot 0.784 \approx 941$

PTS: 2                      REF: 081828aai                      NAT: S.ID.A.4                      TOP: Normal Distributions  
KEY: predict

5 ANS: 2

$$x = \frac{y+1}{y-2}$$

$$xy - 2x = y + 1$$

$$xy - y = 2x + 1$$

$$y(x-1) = 2x + 1$$

$$y = \frac{2x+1}{x-1}$$

PTS: 2 REF: 081714aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: other

6 ANS:

$j(-x) = (-x)^4 - 3(-x)^2 - 4 = x^2 - 3x^2 - 4$  Since  $j(x) = j(-x)$ , the function is even.

PTS: 2 REF: 081731aai NAT: F.BF.B.3 TOP: Even and Odd Functions

7 ANS: 3

$$x^2 + 2x + 1 = -5 + 1$$

$$(x+1)^2 = -4$$

$$x+1 = \pm 2i$$

$$x = -1 \pm 2i$$

PTS: 2 REF: 081703aai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | completing the square

8 ANS:

$$a_1 = 4 \quad a_8 = 639$$

$$a_n = 2a_{n-1} + 1$$

PTS: 2 REF: 081729aai NAT: F.LE.A.2 TOP: Sequences

9 ANS:

Some of the students who did not drink energy drinks read faster than those who did drink energy drinks.

$17.7 - 19.1 = -1.4$  Differences of -1.4 and less occur  $\frac{25}{232}$  or about 10% of the time, so the difference is not unusual.

PTS: 4 REF: 081636aai NAT: S.IC.B.5 TOP: Analysis of Data

10 ANS:

$$x^2 + (x - 28)^2 = 400 \quad y = 12 - 28 = -16 \quad y = 16 - 28 = -12$$

$$x^2 + x^2 - 56x + 784 = 400$$

$$2x^2 - 56x + 384 = 0$$

$$x^2 - 28x + 192 = 0$$

$$(x - 16)(x - 12) = 0$$

$$x = 12, 16$$

PTS: 2 REF: 081831aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

11 ANS: 2

$$\begin{array}{r} x^2 + 0x + 1 \\ x + 2 \overline{) x^3 + 2x^2 + x + 6} \end{array}$$

$$\underline{x^3 + 2x^2}$$

$$0x^2 + x$$

$$\underline{0x^2 + 0x}$$

$$x + 6$$

$$\underline{x + 2}$$

$$4$$

PTS: 2 REF: 081611aii NAT: A.APR.D.6 TOP: Rational Expressions

KEY: division

12 ANS: 1

$$-4(-1) - 3 = 1 \quad 8 = \frac{2\pi}{b}$$

$$b = \frac{\pi}{4}$$

PTS: 2 REF: 081820aii NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

KEY: maximum/minimum

13 ANS: 4

$$d = 32(.8)^{b-1} \quad S_n = \frac{32 - 32(.8)^{12}}{1 - .8} \approx 149$$

PTS: 2 REF: 081721aii NAT: A.SSE.B.4 TOP: Series

14 ANS: 3 PTS: 2 REF: 081724aii NAT: F.BF.A.2

TOP: Sequences

15 ANS: 3

$$2d(d^3 + 3d^2 - 9d - 27)$$

$$2d(d^2(d+3) - 9(d+3))$$

$$2d(d^2 - 9)(d+3)$$

$$2d(d+3)(d-3)(d+3)$$

$$2d(d+3)^2(d-3)$$

PTS: 2 REF: 081615aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

16 ANS:

$$\frac{6.25 - 2.25}{21 - 5} = \frac{4}{16} = \$0.25 \text{ fine per day. } 2.25 - 5(.25) = \$1 \text{ replacement fee. } a_n = 1.25 + (n - 1)(.25). a_{60} = \$16$$

PTS: 4 REF: 081734aai NAT: F.LE.A.2 TOP: Sequences

17 ANS: 1



PTS: 2 REF: 081711aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: percent

18 ANS:

$$7 = 20(0.5)^{\frac{t}{8.02}}$$

$$\log 0.35 = \log 0.5^{\frac{t}{8.02}}$$

$$\log 0.35 = \frac{t \log 0.5}{8.02}$$

$$\frac{8.02 \log 0.35}{\log 0.5} = t$$

$$t \approx 12$$

PTS: 4 REF: 081634aai NAT: F.LE.A.4 TOP: Exponential Decay

19 ANS: 3

$$\frac{x^{\frac{2}{3}} \cdot x^{\frac{5}{2}}}{x^{\frac{1}{6}}} = \frac{x^{\frac{4}{6}} \cdot x^{\frac{15}{6}}}{x^{\frac{1}{6}}} = x^{\frac{18}{6}} = x^3$$

PTS: 2 REF: 081812aai NAT: N.RN.A.2 TOP: Operations with Radicals  
KEY: with variables, index > 2

20 ANS:

Applying the commutative property,  $\left(3^{\frac{1}{5}}\right)^2$  can be rewritten as  $\left(3^2\right)^{\frac{1}{5}}$  or  $9^{\frac{1}{5}}$ . A fractional exponent can be

rewritten as a radical with the denominator as the index, or  $9^{\frac{1}{5}} = \sqrt[5]{9}$ .

PTS: 2 REF: 081626aai NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

21 ANS:

$$2 = e^{0.0375t}$$

$$t \approx 18.5$$

PTS: 4 REF: 081835aai NAT: F.LE.A.4 TOP: Exponential Growth

22 ANS: 2

$$\sqrt{x+14} = \sqrt{2x+5} + 1 \qquad \sqrt{22+14} - \sqrt{2(22)+5} = 1$$

$$x+14 = 2x+5+2\sqrt{2x+5}+1 \qquad 6-7 \neq 1$$

$$-x+8 = 2\sqrt{2x+5}$$

$$x^2 - 16x + 64 = 8x + 20$$

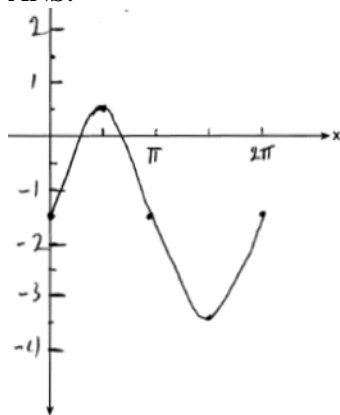
$$x^2 - 24x + 44 = 0$$

$$(x-22)(x-2) = 0$$

$$x = 2, 22$$

PTS: 2 REF: 081704aai NAT: A.REI.A.2 TOP: Solving Radicals  
KEY: advanced

23 ANS:



Part a sketch is shifted  $\frac{\pi}{3}$  units right.

PTS: 4

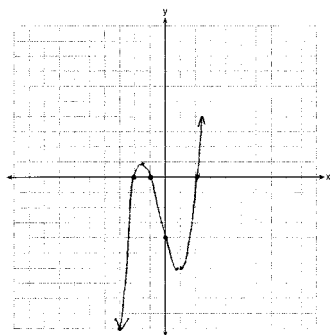
REF: 081735aai

NAT: F.IF.C.7

TOP: Graphing Trigonometric Functions

KEY: graph

24 ANS:



$$0 = x^2(x + 1) - 4(x + 1)$$

$$0 = (x^2 - 4)(x + 1)$$

$$0 = (x + 2)(x - 2)(x + 1)$$

$$x = -2, -1, 2$$

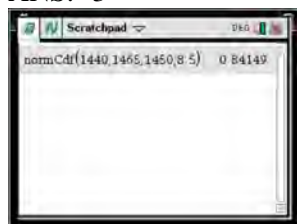
PTS: 4

REF: 081633aai

NAT: F.IF.C.7

TOP: Graphing Polynomial Functions

25 ANS: 3



PTS: 2

REF: 081604aai

NAT: S.ID.A.4

TOP: Normal Distributions

KEY: probability

26 ANS:

$$x = (y - 3)^3 + 1$$

$$x - 1 = (y - 3)^3$$

$$\sqrt[3]{x - 1} = y - 3$$

$$\sqrt[3]{x - 1} + 3 = y$$

$$f^{-1}(x) = \sqrt[3]{x - 1} + 3$$

PTS: 2 REF: fall1509aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: other

27 ANS: 4

$$k^4 - 4k^2 + 8k^3 - 32k + 12k^2 - 48$$

$$k^2(k^2 - 4) + 8k(k^2 - 4) + 12(k^2 - 4)$$

$$(k^2 - 4)(k^2 + 8k + 12)$$

$$(k + 2)(k - 2)(k + 6)(k + 2)$$

PTS: 2 REF: fall1505aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

28 ANS: 3

$$\left(\frac{1}{2}\right)^{\frac{1}{73.83}} \approx 0.990656$$

PTS: 2 REF: 081710aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

KEY: All

29 ANS: 4 PTS: 2 REF: 081803aai NAT: F.BF.A.1

TOP: Operations with Functions

30 ANS:

Let  $x$  equal the first integer and  $x + 1$  equal the next.  $(x + 1)^2 - x^2 = x^2 + 2x + 1 - x^2 = 2x + 1$ .  $2x + 1$  is an odd integer.

PTS: 2 REF: fall1511aai NAT: A.APR.C.4 TOP: Polynomial Identities

31 ANS:

Based on these data, the two events do not appear to be independent.  $P(F) = \frac{106}{200} = 0.53$ , while

$P(F|T) = \frac{54}{90} = 0.6$ ,  $P(F|R) = \frac{25}{65} = 0.39$ , and  $P(F|C) = \frac{27}{45} = 0.6$ . The probability of being female are not the same as the conditional probabilities. This suggests that the events are not independent.

PTS: 2 REF: fall1508aai NAT: S.CP.A.4 TOP: Conditional Probability

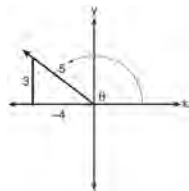
32 ANS: 1 PTS: 2 REF: 081813aai NAT: A.SSE.B.4

TOP: Series



33 ANS: 1

A reference triangle can be sketched using the coordinates  $(-4, 3)$  in the second quadrant to find the value of  $\sin \theta$ .



PTS: 2 REF: spr1503aia NAT: F.TF.A.2 TOP: Determining Trigonometric Functions  
KEY: extension to reals

34 ANS: 4

$$\ln e^{0.3x} = \ln \frac{5918}{87}$$

$$x = \frac{\ln \frac{5918}{87}}{0.3}$$

PTS: 2 REF: 081801aia NAT: F.LE.A.4 TOP: Exponential Equations  
KEY: without common base

35 ANS:

$$P(W/D) = \frac{P(W \cap D)}{P(D)} = \frac{.4}{.5} \approx .8$$

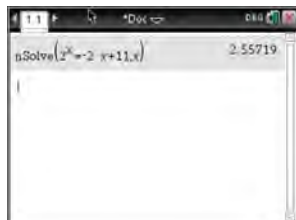
PTS: 2 REF: 081726aia NAT: S.CP.B.6 TOP: Conditional Probability

36 ANS:

$$\frac{306.25 - 156.25}{70 - 50} = \frac{150}{20} = 7.5 \text{ Between 50-70 mph, each additional mph in speed requires 7.5 more feet to stop.}$$

PTS: 2 REF: 081631aia NAT: F.IF.B.6 TOP: Rate of Change  
KEY: AII

37 ANS: 2



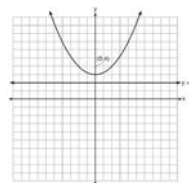
PTS: 2 REF: 081603aia NAT: A.REI.D.11 TOP: Other Systems  
KEY: AII

38 ANS:

$$\frac{p(8) - p(4)}{8 - 4} \approx 48.78$$

PTS: 2 REF: 081827aia NAT: F.IF.B.6 TOP: Rate of Change

39 ANS: 4



A parabola with a focus of  $(0,4)$  and a directrix of  $y = 2$  is sketched as follows: By inspection, it is determined that the vertex of the parabola is  $(0,3)$ . It is also evident that the distance,  $p$ , between the vertex and the focus is 1. It is possible to use the formula  $(x - h)^2 = 4p(y - k)$  to derive the equation of the parabola as follows:  $(x - 0)^2 = 4(1)(y - 3)$

$$x^2 = 4y - 12$$

$$x^2 + 12 = 4y$$

$$\frac{x^2}{4} + 3 = y$$

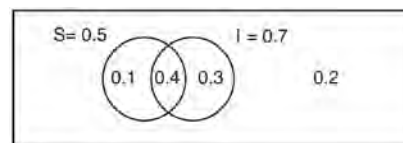
or A point  $(x,y)$  on the parabola must be the same distance from the focus as it is from the directrix. For any such point  $(x,y)$ , the distance to the focus is  $\sqrt{(x - 0)^2 + (y - 4)^2}$  and the distance to the directrix is  $y - 2$ . Setting this equal leads to:  $x^2 + y^2 - 8y + 16 = y^2 - 4y + 4$

$$x^2 + 16 = 4y + 4$$

$$\frac{x^2}{4} + 3 = y$$

PTS: 2 REF: spr1502aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

40 ANS:



This scenario can be modeled with a Venn Diagram: Since  $P(S \cup I) = 0.2$ ,  $P(S \cup I) = 0.8$ . Then,  $P(S \cap I) = P(S) + P(I) - P(S \cup I)$  If  $S$  and  $I$  are independent, then the

$$= 0.5 + 0.7 - 0.8$$

$$= 0.4$$

Product Rule must be satisfied. However,  $(0.5)(0.7) \neq 0.4$ . Therefore, salary and insurance have not been treated independently.

PTS: 4 REF: spr1513aii NAT: S.CP.A.2 TOP: Probability of Compound Events  
KEY: independence

41 ANS: 3

$$\log_{0.8} \left( \frac{V}{17000} \right) = t \quad \frac{17,000(0.8)^3 - 17,000(0.8)^1}{3 - 1} \approx -2450$$

$$0.8^t = \frac{V}{17000}$$

$$V = 17000(0.8)^t$$

PTS: 2

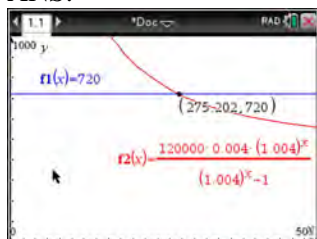
REF: 081709aai

NAT: F.IF.B.6

TOP: Rate of Change

KEY: AII

42 ANS:



$$720 = \frac{120000 \left( \frac{.048}{12} \right) \left( 1 + \frac{.048}{12} \right)^n}{\left( 1 + \frac{.048}{12} \right)^n - 1} \frac{275.2}{12} \approx 23 \text{ years}$$

$$720(1.004)^n - 720 = 480(1.004)^n$$

$$240(1.004)^n = 720$$

$$1.004^n = 3$$

$$n \log 1.004 = \log 3$$

$$n \approx 275.2 \text{ months}$$

PTS: 4

REF: spr1509aai

NAT: A.CED.A.1

TOP: Exponential Growth

43 ANS: 4

If  $1 - i$  is one solution, the other is  $1 + i$ .  $(x - (1 - i))(x - (1 + i)) = 0$ 

$$x^2 - x - ix - x + ix + (1 - i^2) = 0$$

$$x^2 - 2x + 2 = 0$$

PTS: 2

REF: 081601aai

NAT: A.REI.B.4

TOP: Complex Conjugate Root Theorem

44 ANS:

$$8.75 = 1.25x^{49} \quad 4$$

$$7 = x^{49}$$

$$x = \sqrt[49]{7} \approx 1.04$$

PTS: 2

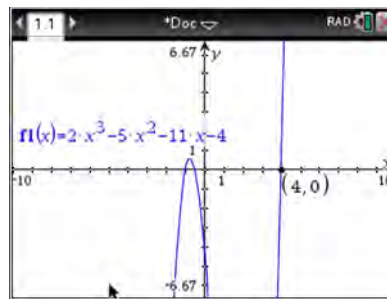
REF: 081730aai

NAT: F.LE.A.4

TOP: Exponential Growth

45 ANS:

$f(4) = 2(4)^3 - 5(4)^2 - 11(4) - 4 = 128 - 80 - 44 - 4 = 0$  Any method that demonstrates 4 is a zero of  $f(x)$  confirms



that  $x - 4$  is a factor, as suggested by the Remainder Theorem.

PTS: 2 REF: spr1507aii NAT: A.APR.B.2 TOP: Remainder Theorem

46 ANS: 1 PTS: 2 REF: 081804aii NAT: F.IF.C.9  
TOP: Comparing Functions

47 ANS:

Rewrite  $\frac{4}{3}$  as  $\frac{1}{3} \cdot \frac{4}{1}$ , using the power of a power rule.

PTS: 2 REF: 081725aii NAT: N.RN.A.1 TOP: Radicals and Rational Exponents

48 ANS:

The mean difference between the students' final grades in group 1 and group 2 is  $-3.64$ . This value indicates that students who met with a tutor had a mean final grade of 3.64 points less than students who used an on-line subscription. One can infer whether this difference is due to the differences in intervention or due to which students were assigned to each group by using a simulation to rerandomize the students' final grades many (500) times. If the observed difference  $-3.64$  is the result of the assignment of students to groups alone, then a difference of  $-3.64$  or less should be observed fairly regularly in the simulation output. However, a difference of  $-3$  or less occurs in only about 2% of the rerandomizations. Therefore, it is quite unlikely that the assignment to groups alone accounts for the difference; rather, it is likely that the difference between the interventions themselves accounts for the difference between the two groups' mean final grades.

PTS: 4 REF: fall1514aii NAT: S.IC.B.5 TOP: Analysis of Data

49 ANS: 4 PTS: 2 REF: 081810aii NAT: F.LE.A.2  
TOP: Sequences

50 ANS:

$$A = 5000(1.045)^n \quad 5000\left(1 + \frac{.046}{4}\right)^{4(6)} - 5000(1.045)^6 \approx 6578.87 - 6511.30 \approx 67.57 \quad 10000 = 5000\left(1 + \frac{.046}{4}\right)^{4n}$$

$$B = 5000\left(1 + \frac{.046}{4}\right)^{4n}$$

$$2 = 1.0115^{4n}$$

$$\log 2 = 4n \cdot \log 1.0115$$

$$n = \frac{\log 2}{4 \log 1.0115}$$

$$n \approx 15.2$$

PTS: 6 REF: 081637aii NAT: A.CED.A.1 TOP: Exponential Growth

51 ANS: 2

$$\text{If } \cos \theta = \frac{7}{25}, \sin \theta = \pm \frac{24}{25}, \text{ and } \tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{-\frac{24}{25}}{\frac{7}{25}} = -\frac{24}{7}$$

PTS: 2 REF: 081811aii NAT: F.TF.C.8 TOP: Determining Trigonometric Functions

52 ANS: 2

The vertex of the parabola is (0,0). The distance,  $p$ , between the vertex and the focus or the vertex and thedirectrix is 1.  $y = \frac{-1}{4p}(x-h)^2 + k$ 

$$y = \frac{-1}{4(1)}(x-0)^2 + 0$$

$$y = -\frac{1}{4}x^2$$

PTS: 2 REF: 081706aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

53 ANS: 3

PTS: 2

REF: 081618aii

NAT: F.LE.A.2

TOP: Sequences

54 ANS:

$$\sin^2 \theta + (-0.7)^2 = 1 \quad \text{Since } \theta \text{ is in Quadrant II, } \sin \theta = \sqrt{.51} \text{ and } \tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{\sqrt{.51}}{-0.7} \approx -1.02$$

$$\sin^2 \theta = .51$$

$$\sin \theta = \pm \sqrt{.51}$$

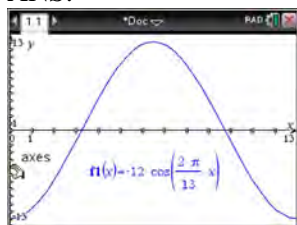
PTS: 2

REF: 081628aii

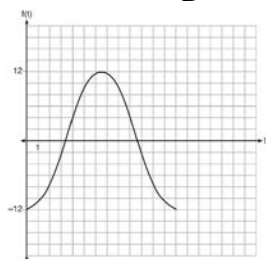
NAT: F.TF.C.8

TOP: Determining Trigonometric Functions

55 ANS:



The amplitude, 12, can be interpreted from the situation, since the water level has a minimum of  $-12$  and a maximum of  $12$ . The value of  $A$  is  $-12$  since at 8:30 it is low tide. The period of the function is 13 hours, and is expressed in the function through the parameter  $B$ . By experimentation with technology or using the relation  $P = \frac{2\pi}{B}$  (where  $P$  is the period), it is determined that  $B = \frac{2\pi}{13}$ .



$$f(t) = -12 \cos\left(\frac{2\pi}{13} t\right)$$

In order to answer the question about when to fish, the student must interpret the function and determine which choice, 7:30 pm or 10:30 pm, is on an increasing interval. Since the function is increasing from  $t = 13$  to  $t = 19.5$  (which corresponds to 9:30 pm to 4:00 am), 10:30 is the appropriate choice.

PTS: 6 REF: spr1514aii NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions  
KEY: graph

56 ANS: 1  
(2) is not recursive

PTS: 2 REF: 081608aii NAT: F.BF.A.2 TOP: Sequences  
57 ANS: 1 PTS: 2 REF: 081609aii NAT: F.BF.B.6  
TOP: Sigma Notation KEY: represent

58 ANS:

The expression is of the form  $y^2 - 5y - 6$  or  $(y - 6)(y + 1)$ . Let  $y = 4x^2 + 5x$ :

$$(4x^2 + 5x - 6)(4x^2 + 5x + 1)$$

$$(4x - 3)(x + 2)(4x + 1)(x + 1)$$

PTS: 2 REF: fall1512aii NAT: A.SSE.A.2 TOP: Factoring Polynomials  
KEY: a>1

59 ANS:

$A(t) = 100(0.5)^{\frac{t}{63}}$ , where  $t$  is time in years, and  $A(t)$  is the amount of titanium-44 left after  $t$  years.

$\frac{A(10) - A(0)}{10 - 0} = \frac{89.58132 - 100}{10} = -1.041868$  The estimated mass at  $t = 40$  is  $100 - 40(-1.041868) \approx 58.3$ . The

actual mass is  $A(40) = 100(0.5)^{\frac{40}{63}} \approx 64.3976$ . The estimated mass is less than the actual mass.

PTS: 6 REF: fall1517aii NAT: F.LE.A.2 TOP: Modeling Exponential Functions  
KEY: AII

60 ANS: 2

$1.00643^{12} \approx 1.08$

PTS: 2 REF: 081808aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions

61 ANS: 1

1) let  $y = x + 2$ , then  $y^2 + 2y - 8$

$$(y + 4)(y - 2)$$

$$(x + 2 + 4)(x + 2 - 2)$$

$$(x + 6)x$$

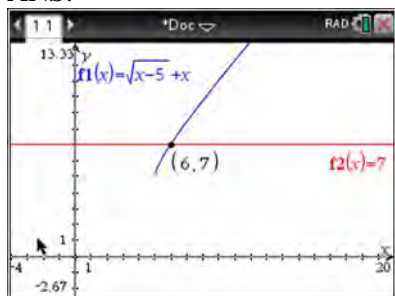
PTS: 2 REF: 081715aii NAT: A.SSE.A.2 TOP: Factoring Polynomials  
KEY: multivariable

62 ANS:

$$\frac{2x^{\frac{3}{2}}}{2x^{\frac{2}{2}}} = x^{\frac{1}{2}} = \sqrt{x}$$

PTS: 2 REF: 081826aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents  
KEY: variables

63 ANS:



$$\sqrt{x-5} = -x+7 \quad \sqrt{x-5} = -9+7 = -2 \text{ is extraneous.}$$

$$x-5 = x^2 - 14x + 49$$

$$0 = x^2 - 15x + 54$$

$$0 = (x-6)(x-9)$$

$$x = 6, 9$$

PTS: 2 REF: spr1508aai NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

64 ANS: 3

$$x^2 - 4x - 5 = 4x^2 - 40x + 100$$

$$3x^2 - 36x + 105 = 0$$

$$x^2 - 12x + 35 = 0$$

$$(x-7)(x-5) = 0$$

$$x = 5, 7$$

PTS: 2 REF: 081807aai NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

65 ANS: 3

$$x = \frac{-2 \pm \sqrt{2^2 - 4(3)(7)}}{2(3)} = \frac{-2 \pm \sqrt{-80}}{6} = \frac{-2 \pm i\sqrt{16}\sqrt{5}}{6} = -\frac{1}{3} \pm \frac{2i\sqrt{5}}{3}$$

PTS: 2 REF: 081809aai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | quadratic formula

66 ANS: 4 PTS: 2 REF: 081708aai NAT: A.APR.B.3

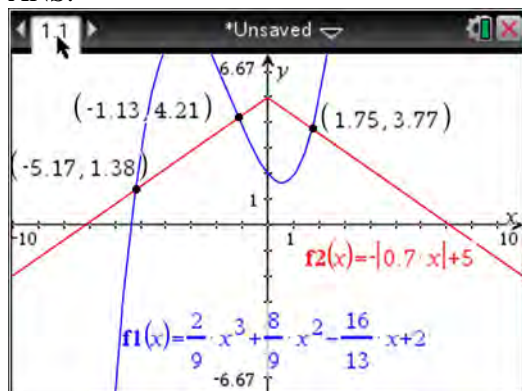
TOP: Zeros of Polynomials KEY: AII

67 ANS: 1 PTS: 2 REF: 081722aai NAT: S.IC.B.6

TOP: Analysis of Data



68 ANS:



PTS: 2 REF: fall1510aai NAT: A.REID.11 TOP: Other Systems

KEY: AII

69 ANS: 1

$$(x+3)^2 + (2x-4)^2 = 8 \quad b^2 - 4ac$$

$$x^2 + 6x + 9 + 4x^2 - 16x + 16 = 8 \quad 100 - 4(5)(17) < 0$$

$$5x^2 - 10x + 17 = 0$$

PTS: 2 REF: 081719aai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

KEY: AII

70 ANS:

$$j(-1) = 2(-1)^4 - (-1)^3 - 35(-1)^2 + 16(-1) + 48 = 2 + 1 - 35 - 16 + 48 = 0; \quad x + 1 \text{ is a factor of } j(x);$$

$$2x^3 - 3x^2 - 32x + 48 = 0$$

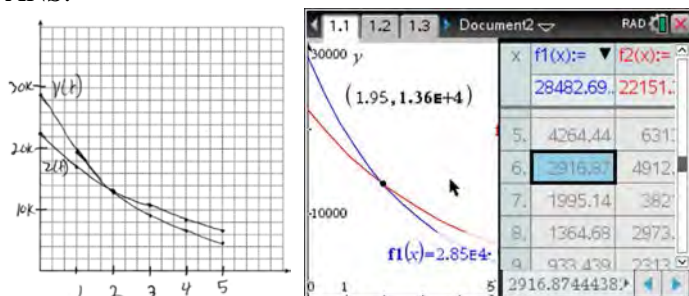
$$x^2(2x-3) - 16(2x-3) = 0$$

$$(x^2 - 16)(2x-3) = 0$$

$$x = \pm 4, \frac{3}{2}$$

PTS: 4 REF: 081834aai NAT: A.APR.B.2 TOP: Remainder Theorem

71 ANS:



At 1.95 years, the value of the car equals the loan balance. Zach can cancel the policy after 6 years.

PTS: 4 REF: 081737aai NAT: A.REI.D.11 TOP: Other Systems  
KEY: All

72 ANS: 1

The graph of  $y = \sin x$  is unchanged when rotated  $180^\circ$  about the origin.

PTS: 2 REF: 081614aai NAT: F.BF.B.3 TOP: Even and Odd Functions

73 ANS:

Amplitude, because the height of the graph shows the volume of the air.

PTS: 2 REF: 081625aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions  
KEY: mixed

74 ANS:

$$\text{normcdf}(510, 540, 480, 24) = 0.0994 \quad z = \frac{510 - 480}{24} = 1.25 \quad 1.25 = \frac{x - 510}{20} \quad 2.5 = \frac{x - 510}{20} \quad 535 - 560$$

$$z = \frac{540 - 480}{24} = 2.5 \quad x = 535 \quad x = 560$$

PTS: 4 REF: fall1516aai NAT: S.ID.A.4 TOP: Normal Distributions  
KEY: probability

75 ANS:

Since there are six flavors, each flavor can be assigned a number, 1-6. Use the simulation to see the number of times the same number is rolled 4 times in a row.

PTS: 2 REF: 081728aai NAT: S.IC.A.2 TOP: Analysis of Data

76 ANS:

$2(0.042) = 0.084 \approx 0.08$  The percent of users making in-app purchases will be within 4% of 35%.

PTS: 2 REF: 081832aai NAT: S.IC.B.4 TOP: Analysis of Data

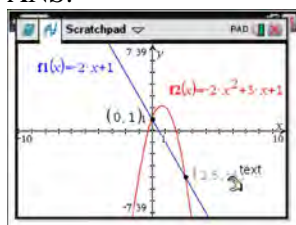
77 ANS: 2

$B(t) = 750 \left( 1.16^{\frac{1}{12}} \right)^{12t} \approx 750(1.012)^{12t}$   $B(t) = 750 \left( 1 + \frac{0.16}{12} \right)^{12t}$  is wrong, because the growth is an annual rate that is not compounded monthly.

PTS: 2 REF: spr1504aii NAT: A.SSE.B.3 TOP: Modeling Exponential Functions  
KEY: AII

78 ANS: 3 PTS: 2 REF: 081705aii NAT: F.IF.B.4  
TOP: Graphing Trigonometric Functions KEY: increasing/decreasing

79 ANS:



$$-2x + 1 = -2x^2 + 3x + 1$$

$$2x^2 - 5x = 0$$

$$x(2x - 5) = 0$$

$$x = 0, \frac{5}{2}$$

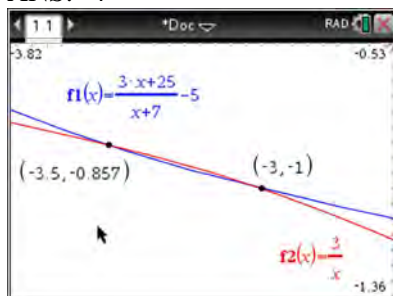
PTS: 2 REF: fall1507aii NAT: A.REI.C.7 TOP: Quadratic-Linear Systems  
KEY: AII

80 ANS: 2

$$ME = \left( z \sqrt{\frac{p(1-p)}{n}} \right) = \left( 1.96 \sqrt{\frac{(0.55)(0.45)}{900}} \right) \approx 0.03$$

PTS: 2 REF: 081612aii NAT: S.IC.B.4 TOP: Analysis of Data

81 ANS: 4



$$x(x+7) \left[ \frac{3x+25}{x+7} - 5 = \frac{3}{x} \right]$$

$$x(3x+25) - 5x(x+7) = 3(x+7)$$

$$3x^2 + 25x - 5x^2 - 35x = 3x + 21$$

$$2x^2 + 13x + 21 = 0$$

$$(2x+7)(x+3) = 0$$

$$x = -\frac{7}{2}, -3$$

PTS: 2 REF: fall1501aii NAT: A.REI.A.2 TOP: Solving Rationals  
KEY: rational solutions

82 ANS: 3

$$-33t^2 + 360t = 700 + 5t$$

$$-33t^2 + 355t - 700 = 0$$

$$t = \frac{-355 \pm \sqrt{355^2 - 4(-33)(-700)}}{2(-33)} \approx 3, 8$$

PTS: 2 REF: 081606aii NAT: A.REI.D.11 TOP: Quadratic-Linear Systems  
KEY: All

83 ANS:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \quad A \text{ and } B \text{ are independent since } P(A \cap B) = P(A) \cdot P(B)$$

$$0.8 = 0.6 + 0.5 - P(A \cap B)$$

$$0.3 = 0.6 \cdot 0.5$$

$$P(A \cap B) = 0.3$$

$$0.3 = 0.3$$

PTS: 2 REF: 081632aii NAT: S.CP.A.2 TOP: Probability of Compound Events  
KEY: independence

84 ANS: 2 PTS: 2 REF: 081610aii NAT: F.IF.B.4  
TOP: Graphing Trigonometric Functions KEY: increasing/decreasing

85 ANS: 3

$$-3 + 5i - (4 + 24i - 2i - 12i^2) = -3 + 5i - (16 + 22i) = -19 - 17i$$

PTS: 2 REF: 081815aii NAT: N.CN.A.2 TOP: Operations with Complex Numbers

86 ANS:

John found the means of the scores of the two rooms and subtracted the means. The mean score for the classical room was 7 higher than the rap room (82-75). Yes, there is less than a 5% chance this difference occurring due to random chance. It is likely the difference was due to the music.

PTS: 4 REF: 081836aai NAT: S.IC.B.5 TOP: Analysis of Data

87 ANS: 3

$$(m-2)^2(m+3) = (m^2 - 4m + 4)(m+3) = m^3 + 3m^2 - 4m^2 - 12m + 4m + 12 = m^3 - m^2 - 8m + 12$$

PTS: 2 REF: 081605aai NAT: A.SSE.A.2 TOP: Factoring Polynomials  
KEY: factoring by grouping

88 ANS: 3

$$(3k-2i)^2 = 9k^2 - 12ki + 4i^2 = 9k^2 - 12ki - 4$$

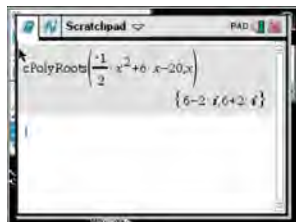
PTS: 2 REF: 081702aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

89 ANS:

$$(x^2 - 6)(x^2 + 2)$$

PTS: 2 REF: 081825aai NAT: A.SSE.A.2 TOP: Factoring Polynomials  
KEY: higher power

90 ANS: 3



$$-2\left(-\frac{1}{2}x^2 = -6x + 20\right)$$

$$x^2 - 12x = -40$$

$$x^2 - 12x + 36 = -40 + 36$$

$$(x-6)^2 = -4$$

$$x-6 = \pm 2i$$

$$x = 6 \pm 2i$$

PTS: 2 REF: fall1504aai NAT: A.REI.B.4 TOP: Solving Quadratics  
KEY: complex solutions | completing the square

91 ANS: 4 PTS: 2 REF: 081817aai NAT: F.BF.B.3

TOP: Transformations with Functions

92 ANS: 1

The zeros of the polynomial are at  $-b$ , and  $c$ . The sketch of a polynomial of degree 3 with a negative leading coefficient should have end behavior showing as  $x$  goes to negative infinity,  $f(x)$  goes to positive infinity. The multiplicities of the roots are correctly represented in the graph.

PTS: 2 REF: spr1501aai NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

KEY: bimodalgraph

93 ANS:

$$(4 - 3i)(5 + 2yi - 5 + 2yi)$$

$$(4 - 3i)(4yi)$$

$$16yi - 12yi^2$$

$$12y + 16yi$$

PTS: 2 REF: spr1506aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

94 ANS:

$$4x + 6y - 8z = -2 \quad 4x - 8y + 20z = 12 \quad z + 2 = 3z - 4 \quad y = 3 + 2 = 5 \quad -4x + 5 + 3 = 16$$

$$\underline{-4x + y + z = 16} \quad \underline{-4x + y + z = 16} \quad 6 = 2z \quad -4x = 8$$

$$7y - 7z = 14 \quad -7y + 21z = 28 \quad z = 3 \quad x = -2$$

$$y - z = 2 \quad y - 3z = -4$$

$$y = z + 2 \quad y = 3z - 4$$

PTS: 4 REF: 081833aai NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

95 ANS: 3

PTS: 2

REF: 081819aai

NAT: A.REI.D.11

TOP: Other Systems

96 ANS: 4

$$(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3 \neq x^3 + 3xy + y^3$$

PTS: 2 REF: 081620aai NAT: A.APR.C.4 TOP: Polynomial Identities

97 ANS: 4

$$(x^6y^4 - 9)(x^4 - 16)$$

$$(x^3y^2 + 3)(x^3y^2 - 3)(x^2 + 4)(x^2 - 4)$$

PTS: 2 REF: 081814aai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

KEY: multivariable AII

98 ANS: 4

$$\left(\frac{-54x^9}{y^4}\right)^{\frac{2}{3}} = \frac{(2 \cdot -27)^{\frac{2}{3}} x^{\frac{18}{3}}}{y^{\frac{8}{3}}} = \frac{2^{\frac{2}{3}} \cdot 9x^6}{y^2 \cdot y^{\frac{2}{3}}} = \frac{9x^6 \sqrt[3]{4}}{y^2 \sqrt[3]{y^2}}$$

PTS: 2 REF: 081723aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: variables

99 ANS: 1

II. Ninth graders drive to school less often; III. Students know little about adults; IV. Calculus students love math!

PTS: 2 REF: 081602aai NAT: S.IC.B.3 TOP: Analysis of Data

KEY: bias

100 ANS:

$$y = 4.168(3.981)^x \quad 100 = 4.168(3.981)^x$$

$$\log \frac{100}{4.168} = \log(3.981)^x$$

$$\log \frac{100}{4.168} = x \log(3.981)$$

$$\frac{\log \frac{100}{4.168}}{\log(3.981)} = x$$

$$x \approx 2.25$$

PTS: 4 REF: 081736aai NAT: S.ID.B.6 TOP: Regression

KEY: exponential AII

101 ANS: 2

$$P = \frac{2\pi}{\frac{\pi}{45}} = 90$$

PTS: 2 REF: 081822aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: period

102 ANS: 1

$$x^2 + 2x - 8 = 0$$

$$(x+4)(x-2) = 0$$

$$x = -4, 2$$

PTS: 2 REF: 081701aai NAT: A.APR.D.6 TOP: Undefined Rationals

103 ANS:

$$0 = 6(-5)^3 + b(-5)^2 - 52(-5) + 15 \quad z(x) = 6x^3 + 19x^2 - 52x + 15$$

$$0 = -750 + 25b + 260 + 15$$

$$475 = 25b$$

$$19 = b$$

$$\begin{array}{r|rrrr} -5 & 6 & 19 & -52 & 15 \\ & & -30 & 55 & 15 \\ \hline & 6 & -11 & 3 & 0 \end{array}$$

$$6x^2 - 11x + 3 = 0$$

$$(2x - 3)(3x - 1) = 0$$

$$x = \frac{3}{2}, \frac{1}{3}, -5$$

PTS: 4 REF: fall1515aii NAT: A.APR.B.2 TOP: Remainder Theorem

104 ANS: 4

The vertex is (2,2) and  $p = 3$ .  $3 + 2 = 5$ 

PTS: 2 REF: 081823aii NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

105 ANS:

$$\frac{3p}{p-5} = \frac{p+2}{p+3}$$

$$3p^2 + 9p = p^2 - 3p - 10$$

$$2p^2 + 12p + 10 = 0$$

$$p^2 + 6p + 5 = 0$$

$$(p+5)(p+1) = 0$$

$$p = -5, -1$$

PTS: 4 REF: 081733aii NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

106 ANS: 2 PTS: 2 REF: 081717aii NAT: S.IC.B.3  
TOP: Analysis of Data KEY: type

107 ANS: 2

$$y = \frac{1}{2}x + 8 \quad x = \frac{1}{2}y + 8$$

$$2x = y + 16$$

$$y = 2x - 16$$

PTS: 2 REF: 081806aii NAT: F.BF.B.4 TOP: Inverse of Functions  
KEY: linear



108 ANS:

$$xi(-6i)^2 = xi(36i^2) = 36xi^3 = -36xi$$

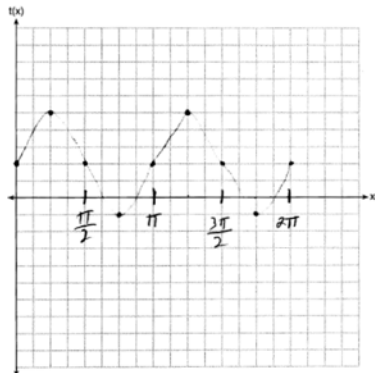
PTS: 2

REF: 081627aai

NAT: N.CN.A.2

TOP: Operations with Complex Numbers

109 ANS:



PTS: 2

REF: 081830aai

NAT: F.IF.C.7

TOP: Graphing Trigonometric Functions

KEY: graph

110 ANS: 1

$$\begin{array}{r} 2x^2 + x + 5 \\ 2x - 1 \overline{) 4x^3 + 0x^2 + 9x - 5} \\ \underline{4x^3 - 2x^2} \phantom{- 5} \\ 2x^2 + 9x \phantom{- 5} \\ \underline{2x^2 - x} \phantom{- 5} \\ 10x - 5 \\ \underline{10x - 5} \\ 0 \end{array}$$

PTS: 2

REF: 081713aai

NAT: A.APR.D.6

TOP: Rational Expressions

KEY: division

111 ANS: 4

$$\begin{aligned} m^3 - 2m^2 + 4m - 8 &= 0 \\ m^2(m - 2) + 4(m - 2) &= 0 \\ (m^2 + 4)(m - 2) &= 0 \end{aligned}$$

PTS: 2

REF: 081821aai

NAT: A.APR.D.6

TOP: Solving Polynomial Equations

112 ANS: 2

$$ME = \left( z \sqrt{\frac{p(1-p)}{n}} \right) = \left( 1.96 \sqrt{\frac{(0.16)(0.84)}{1334}} \right) \approx 0.02$$

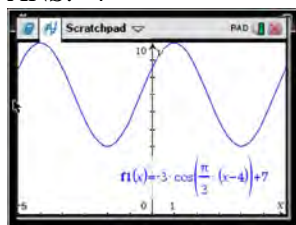
PTS: 2

REF: 081716aai

NAT: S.IC.B.4

TOP: Analysis of Data

113 ANS: 4



As the range is  $[4,10]$ , the midline is  $y = \frac{4+10}{2} = 7$ .

PTS: 2 REF: fall1506aia NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions  
KEY: mixed

114 ANS: 2

$$\begin{array}{r|rrrr} -4 & 1 & -11 & 16 & 84 \\ & & -4 & 60 & -304 \\ \hline & 1 & -15 & 76 & \end{array}$$

Since there is a remainder when the cubic is divided by  $x + 4$ , this binomial is not a factor.

PTS: 2 REF: 081720aia NAT: A.APR.B.2 TOP: Remainder Theorem  
115 ANS: 4 PTS: 2 REF: 081707aia NAT: F.TF.A.2  
TOP: Reference Angles KEY: bimodalgraph

116 ANS:

$0 = \log_{10}(x-4)$  The  $x$ -intercept of  $h$  is  $(2,0)$ .  $f$  has the larger value.

$$10^0 = x - 4$$

$$1 = x - 4$$

$$x = 5$$

PTS: 2 REF: 081630aia NAT: F.IF.C.9 TOP: Comparing Functions  
KEY: All  
117 ANS: 2 PTS: 2 REF: 081802aia NAT: S.IC.B.3  
TOP: Analysis of Data KEY: type  
118 ANS: 4 PTS: 2 REF: 081622aia NAT: F.BF.A.1  
TOP: Modeling Exponential Functions KEY: All  
119 ANS:

$$\left(\sqrt{2x-7}\right)^2 = (5-x)^2 \quad \sqrt{2(4)-7} + 4 = 5 \quad \sqrt{2(8)-7} + 8 = 5$$

$$2x - 7 = 25 - 10x + x^2 \quad \sqrt{1} = 1 \quad \sqrt{9} \neq -3$$

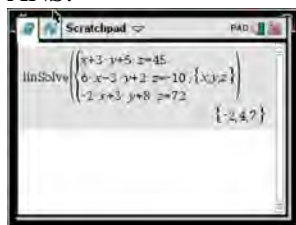
$$0 = x^2 - 12x + 32$$

$$0 = (x-8)(x-4)$$

$$x = 4, 8$$

PTS: 4 REF: 081635aia NAT: A.REI.A.2 TOP: Solving Radicals  
KEY: extraneous solutions

120 ANS:



$$6x - 3y + 2z = -10 \quad x + 3y + 5z = 45 \quad 4x + 10z = 62 \quad 4x + 4(7) = 20$$

$$-2x + 3y + 8z = 72 \quad 6x - 3y + 2z = -10 \quad 4x + 4z = 20 \quad 4x = -8$$

$$4x + 10z = 62 \quad 7x + 7z = 35 \quad 6z = 42 \quad x = -2$$

$$4x + 4z = 20 \quad z = 7$$

$$6(-2) - 3y + 2(7) = -10$$

$$-3y = -12$$

$$y = 4$$

PTS: 4 REF: spr1510aia NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

121 ANS:

$$\frac{x^{\frac{8}{3}}}{x^{\frac{4}{3}}} = x^y$$

$$x^{\frac{4}{3}} = x^y$$

$$\frac{4}{3} = y$$

PTS: 2 REF: spr1505aia NAT: N.RN.A.2 TOP: Radicals and Rational Exponents

KEY: numbers

122 ANS:

$$-6(x+3)\left(\frac{-3}{x+3} - \frac{x}{6} + 1 = 0\right)$$

$$18 + x(x+3) - 6(x+3) = 0$$

$$18 + x^2 + 3x - 6x - 18 = 0$$

$$x^2 - 3x = 0$$

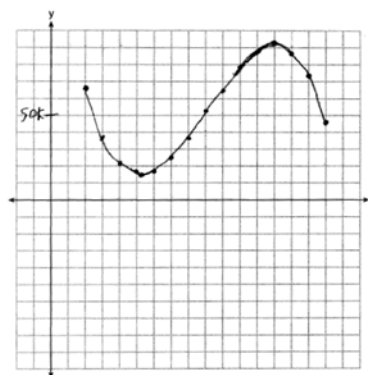
$$x(x-3) = 0$$

$$x = 0, 3$$

PTS: 2 REF: 081829aia NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

123 ANS:



$$P(x) = R(x) - C(x) = -330x^3 + 9000x^2 - 67000x + 167000$$

Least profitable at year 5 because there is a minimum in  $P(x)$ . Most profitable at year 13 because there is a maximum in  $P(x)$ .

PTS: 6 REF: 081837aai NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

124 ANS:

$$(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$$

$$x^4 + 2x^2y^2 + y^4 = x^4 - 2x^2y^2 + y^4 + 4x^2y^2$$

$$x^4 + 2x^2y^2 + y^4 = x^4 + 2x^2y^2 + y^4$$

PTS: 2 REF: 081727aai NAT: A.APR.C.4 TOP: Polynomial Identities

125 ANS: 2 PTS: 2 REF: 081816aai NAT: F.IF.C.7

TOP: Graphing Logarithmic Functions KEY: bimodalgraph

126 ANS: 1 PTS: 2 REF: 081616aai NAT: F.TF.A.1

TOP: Unit Circle KEY: bimodalgraph

127 ANS: 4

$$m^5 + m^3 - 6m = m(m^4 + m^2 - 6) = m(m^2 + 3)(m^2 - 2)$$

PTS: 2 REF: 011703aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: higher power AII

128 ANS:

Yes. The margin of error from this simulation indicates that 95% of the observations fall within  $\pm 0.12$  of the simulated proportion, 0.25. The margin of error can be estimated by multiplying the standard deviation, shown to

be 0.06 in the dotplot, by 2, or applying the estimated standard error formula,  $\left( \sqrt{\frac{p(1-p)}{n}} \right)$  or  $\left( \sqrt{\frac{(0.25)(0.75)}{50}} \right)$

and multiplying by 2. The interval  $0.25 \pm 0.12$  includes plausible values for the true proportion of people who prefer Stephen's new product. The company has evidence that the population proportion could be at least 25%. As seen in the dotplot, it can be expected to obtain a sample proportion of 0.18 (9 out of 50) or less several times, even when the population proportion is 0.25, due to sampling variability. Given this information, the results of the survey do not provide enough evidence to suggest that the true proportion is not at least 0.25, so the development of the product should continue at this time.

PTS: 4 REF: spr1512aai NAT: S.IC.B.4 TOP: Analysis of Data

129 ANS:

$$a_n = x^{n-1}(x+1) \quad x^{n-1} = 0 \quad x+1 = 0$$

$$x = 0 \quad x = -1$$

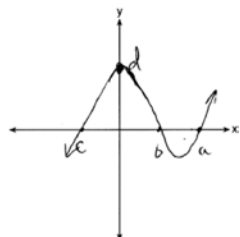
PTS: 4

REF: spr1511aii

NAT: F.BF.A.2

TOP: Sequences

130 ANS:



PTS: 2

REF: 081732aii

NAT: F.IF.C.7

TOP: Graphing Polynomial Functions

KEY: AII

131 ANS: 1

The car lost approximately 19% of its value each year.

PTS: 2

REF: 081613aii

NAT: F.LE.B.5

TOP: Modeling Exponential Functions

132 ANS: 1

$$P(28) = 5(2)^{\frac{98}{28}} \approx 56$$

PTS: 2

REF: 011702aii

NAT: F.LE.A.2

TOP: Modeling Exponential Functions

KEY: AII

133 ANS: 1

PTS: 2

REF: 011704aii

NAT: F.TF.C.8

TOP: Simplifying Trigonometric Expressions

134 ANS: 3

Since  $x + 4$  is a factor of  $p(x)$ , there is no remainder.

PTS: 2

REF: 081621aii

NAT: A.APR.B.2

TOP: Remainder Theorem

135 ANS: 3

PTS: 2

REF: 011708aii

NAT: F.BF.B.4

TOP: Inverse of Functions

KEY: other

136 ANS: 3

$$\frac{1}{J} = \frac{1}{F} - \frac{1}{W}$$

$$\frac{1}{J} = \frac{W-F}{FW}$$

$$J = \frac{FW}{W-F}$$

PTS: 2

REF: 081617aii

NAT: A.REI.A.2

TOP: Solving Rationals

KEY: rational solutions

137 ANS: 4

PTS: 2

REF: 081718aii

NAT: F.IF.C.7

TOP: Graphing Trigonometric Functions

KEY: amplitude

138 ANS: 1

$$\begin{array}{r}
 3x^2 + 4x - 1 \\
 2x + 3 \overline{) 6x^3 + 17x^2 + 10x + 2} \\
 \underline{6x^3 + 9x^2} \phantom{+ 10x + 2} \\
 8x^2 + 10x \phantom{+ 2} \\
 \underline{8x^2 + 12x} \phantom{+ 2} \\
 -2x + 2 \\
 \underline{-2x - 3} \\
 5
 \end{array}$$

PTS: 2 REF: fall1503aii NAT: A.APR.D.6 TOP: Rational Expressions  
 KEY: division

139 ANS: 3

$f(x) = -f(x)$ , so  $f(x)$  is odd.  $g(-x) \neq g(x)$ , so  $g(x)$  is not even.  $g(-x) \neq -g(x)$ , so  $g(x)$  is not odd.  $h(-x) = h(x)$ , so  $h(x)$  is even.

PTS: 2 REF: fall1502aii NAT: F.BF.B.3 TOP: Even and Odd Functions

140 ANS: 2

$$\begin{array}{r}
 85 \\
 \hline
 210 + 85
 \end{array}$$

PTS: 2 REF: 081818aii NAT: S.CP.A.1 TOP: Venn Diagrams

141 ANS: 4

The maximum volume of  $p(x) = -(x+2)(x-10)(x-14)$  is about 56, at  $x = 12.1$

PTS: 2 REF: 081712aii NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

142 ANS: 4 PTS: 2 REF: 081624aii NAT: F.BF.A.2

TOP: Sequences

143 ANS:

Using a 95% level of confidence,  $x \pm 2$  standard deviations sets the usual wait time as 150-302 seconds. 360 seconds is unusual.

PTS: 2 REF: 081629aii NAT: S.IC.B.6 TOP: Analysis of Data

144 ANS: 2

$$\left( m^{\frac{5}{3}} \right)^{-\frac{1}{2}} = m^{-\frac{5}{6}} = \frac{1}{\sqrt[6]{m^5}}$$

PTS: 2 REF: 011707aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents  
 KEY: variables

## Algebra II Regents at Random Answer Section

145 ANS:

Self selection is a cause of bias because people with more free time are more likely to respond.

PTS: 2

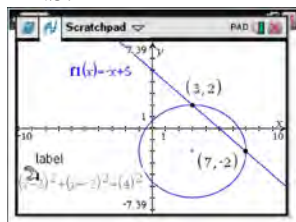
REF: 061828aai

NAT: S.IC.B.3

TOP: Analysis of Data

KEY: bias

146 ANS:



$$y = -x + 5 \quad y = -7 + 5 = -2$$

$$(x - 3)^2 + (-x + 5 + 2)^2 = 16 \quad y = -3 + 5 = 2$$

$$x^2 - 6x + 9 + x^2 - 14x + 49 = 16$$

$$2x^2 - 20x + 42 = 0$$

$$x^2 - 10x + 21 = 0$$

$$(x - 7)(x - 3) = 0$$

$$x = 7, 3$$

PTS: 4

REF: 061633aai

NAT: A.REI.C.7

TOP: Quadratic-Linear Systems

KEY: All

147 ANS: 4

$$4(x^2 - 6x + 9) + 4(y^2 + 18y + 81) = 76 + 36 + 324$$

$$4(x - 3)^2 + 4(y + 9)^2 = 436$$

PTS: 2

REF: 061619aai

NAT: G.GPE.A.1

TOP: Equations of Circles

KEY: completing the square

148 ANS: 1

$$\frac{A}{P} = e^{rt}$$

$$0.42 = e^{rt}$$

$$\ln 0.42 = \ln e^{rt}$$

$$-0.87 \approx rt$$

PTS: 2

REF: 011723aai

NAT: F.BF.A.1

TOP: Modeling Exponential Functions

KEY: All

149 ANS: 3

$$\frac{x^2(x+2) - 9(x+2)}{x(x^2 - x - 6)} = \frac{(x^2 - 9)(x+2)}{x(x-3)(x+2)} = \frac{(x+3)(x-3)}{x(x-3)} = \frac{x+3}{x}$$

PTS: 2 REF: 061803aai NAT: A.APR.D.6 TOP: Rational Expressions  
KEY: factoring

150 ANS: 4

$$\frac{m(c)}{g(c)} = \frac{c+1}{1-c^2} = \frac{c+1}{(1+c)(1-c)} = \frac{1}{1-c}$$

PTS: 2 REF: 061608aai NAT: F.BF.A.1 TOP: Operations with Functions

151 ANS:

$q$  has the smaller minimum value for the domain  $[-2, 2]$ .  $h$ 's minimum is  $-1(2(-1) + 1)$  and  $q$ 's minimum is  $-8$ .

PTS: 2 REF: 011830aai NAT: F.IF.C.9 TOP: Comparing Functions  
KEY: All

152 ANS: 3

$$e^{bt} = \frac{c}{a}$$

$$\ln e^{bt} = \ln \frac{c}{a}$$

$$bt \ln e = \ln \frac{c}{a}$$

$$t = \frac{\ln \frac{c}{a}}{b}$$

PTS: 2 REF: 011813aai NAT: F.LE.A.4 TOP: Exponential Growth

153 ANS: 2

$$S_{20} = \frac{.01 - .01(3)^{20}}{1-3} = 17,433,922$$

PTS: 2 REF: 011822aai NAT: A.SSE.B.4 TOP: Series

154 ANS:

$a_1 = 3$   $a_2 = 7$   $a_3 = 15$   $a_4 = 31$ ; No, because there is no common ratio:  $\frac{7}{3} \neq \frac{15}{7}$

PTS: 4 REF: 061830aai NAT: F.IF.A.3 TOP: Sequences  
KEY: term



155 ANS: 2

$$\cos \theta = \pm \sqrt{1 - \left(\frac{-\sqrt{2}}{5}\right)^2} = \pm \sqrt{\frac{25}{25} - \frac{2}{25}} = \pm \frac{\sqrt{23}}{5}$$

PTS: 2

REF: 061712aai

NAT: F.TF.C.8

TOP: Determining Trigonometric Functions

156 ANS: 4

$$4x^2 = -98$$

$$x^2 = -\frac{98}{4}$$

$$x^2 = -\frac{49}{2}$$

$$x = \pm \sqrt{-\frac{49}{2}} = \pm \frac{7i}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \pm \frac{7i\sqrt{2}}{2}$$

PTS: 2

REF: 061707aai

NAT: A.REI.B.4

TOP: Solving Quadratics

KEY: complex solutions | taking square roots

157 ANS: 3

$$440 \times 2.3\% \approx 10$$

PTS: 2

REF: 011807aai

NAT: S.ID.A.4

TOP: Normal Distributions

KEY: predict

158 ANS: 3

$$0.75^{\frac{1}{10}} \approx .9716$$

PTS: 2

REF: 061713aai

NAT: A.SSE.B.3

TOP: Modeling Exponential Functions

KEY: All

159 ANS: 3

PTS: 2

REF: 061722aai

NAT: A.CED.A.1

TOP: Modeling Rationals

160 ANS: 4

PTS: 2

REF: 061716aai

NAT: N.RN.A.2

TOP: Radicals and Rational Exponents

KEY: variables

161 ANS:

$$20e^{.05t} = 30e^{.03t}$$

$$\frac{\frac{2}{3}e^{.05t}}{e^{.05t}} = \frac{e^{.03t}}{e^{.05t}}$$

$$\ln \frac{2}{3} = \ln e^{-.02t}$$

$$\ln \frac{2}{3} = -.02t \ln e$$

$$\frac{\ln \frac{2}{3}}{-.02} = t$$

$$20.3 \approx t$$

PTS: 2 REF: 011829aai NAT: A.REI.D.11 TOP: Other Systems  
KEY: All

162 ANS:

$$D = 1.223(2.652)^A$$

PTS: 2 REF: 011826aai NAT: S.ID.B.6 TOP: Regression  
KEY: exponential All

163 ANS: 2 PTS: 2 REF: 011820aai NAT: S.IC.A.2  
TOP: Analysis of Data

164 ANS:

$138.905 \pm 2 \cdot 7.95 = 123 - 155$ . No, since 125 (50% of 250) falls within the 95% interval.

PTS: 4 REF: 011835aai NAT: S.IC.A.2 TOP: Analysis of Data

165 ANS: 4

$$\frac{-3x^2 - 5x + 2}{x^3 + 2x^2} = \frac{(-3x + 1)(x + 2)}{x^2(x + 2)} = \frac{-3x}{x^2} + \frac{1}{x^2} = -3x^{-1} + x^{-2}$$

PTS: 2 REF: 061723aai NAT: A.APR.D.6 TOP: Expressions with Negative Exponents  
KEY: variables

166 ANS:

$$\sqrt[3]{x} \cdot \sqrt{x} = x^{\frac{1}{3}} \cdot x^{\frac{1}{2}} = x^{\frac{3}{6}} \cdot x^{\frac{3}{6}} = x^{\frac{5}{6}}$$

PTS: 2 REF: 061731aai NAT: N.RN.A.2 TOP: Operations with Radicals  
KEY: with variables, index > 2

167 ANS: 4 PTS: 2 REF: 011805aai NAT: F.LE.B.5  
TOP: Modeling Exponential Functions

168 ANS: 4

$$\log_2(x-1) - 1 = 0$$

$$\log_2(x-1) = 1$$

$$x-1 = 2^1$$

$$x = 3$$

PTS: 2 REF: 061819aai NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

169 ANS: 1

$$\begin{array}{r|rrrrr} 2 & 1 & 0 & -4 & -4 & 8 \\ & & 2 & 4 & 0 & -8 \\ \hline & 1 & 2 & 0 & -4 & 0 \end{array}$$

Since there is no remainder when the quartic is divided by  $x-2$ , this binomial is a factor.

PTS: 2 REF: 061711aai NAT: A.APR.B.2 TOP: Remainder Theorem

170 ANS: 1 PTS: 2 REF: 061708aai NAT: F.TF.B.5

TOP: Modeling Trigonometric Functions

171 ANS: 1

$$9110 = 5000e^{30r}$$

$$\ln \frac{911}{500} = \ln e^{30r}$$

$$\frac{\ln \frac{911}{500}}{30} = r$$

$$r \approx .02$$

PTS: 2 REF: 011810aai NAT: F.LE.A.4 TOP: Exponential Growth

172 ANS:

period is  $\frac{2}{3}$ . The wheel rotates once every  $\frac{2}{3}$  second.

PTS: 2 REF: 061728aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions

KEY: period

173 ANS: 2 PTS: 2 REF: 011804aai NAT: F.TF.A.2

TOP: Determining Trigonometric Functions

KEY: radians

174 ANS: 4

$$p(5) = 2(5)^3 - 3(5) + 5 = 240$$

PTS: 2 REF: 011819aai NAT: A.APR.B.2 TOP: Remainder Theorem

175 ANS: 4

$$496 \pm 2(115)$$

PTS: 2 REF: 011718aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: interval

176 ANS: 1

$$p(x) = r(x) - c(x)$$

$$-0.5x^2 + 250x - 300 = -0.3x^2 + 150x - c(x)$$

$$c(x) = 0.2x^2 - 100x + 300$$

PTS: 2 REF: 061813aai NAT: F.BF.A.1 TOP: Operations with Functions

177 ANS: 2

 $h(x)$  does not have a  $y$ -intercept.

PTS: 2 REF: 011719aai NAT: F.IF.C.9 TOP: Comparing Functions

178 ANS:

$$C(t) = 63000 \left(1 + \frac{0.0255}{12}\right)^{12t} = 100000$$

$$12t \log(1.002125) = \log \frac{100}{63}$$

$$t \approx 18.14$$

PTS: 4 REF: 061835aai NAT: A.CED.A.1 TOP: Exponential Growth

179 ANS: 4

The scenario represents a decreasing geometric sequence with a common ratio of 0.80.

PTS: 2 REF: 061610aai NAT: F.BF.A.2 TOP: Sequences

180 ANS:

$$\frac{h(2) - h(1)}{2 - 1} = -12, \quad h(t) = 0 \text{ at } t \approx 2.2, 3.8, \text{ using a graphing calculator to find where } h(t) = 0.$$

PTS: 4 REF: 061836aai NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions

181 ANS: 3

PTS: 2

REF: 011824aai

NAT: F.BF.A.2

TOP: Sequences

182 ANS:

$$M = \frac{(152500 - 15250) \left(\frac{.036}{12}\right) \left(1 + \frac{.036}{12}\right)^{360}}{\left(1 + \frac{.036}{12}\right)^{360} - 1} \approx 624$$

PTS: 2 REF: 061831aai NAT: A.SSE.B.4 TOP: Series

183 ANS: 3

PTS: 2

REF: 061607aai

NAT: S.IC.A.2

TOP: Analysis of Data

184 ANS: 4

$$0.48 \cdot 0.25 = 0.12$$

PTS: 1 REF: 061811aai NAT: S.CP.A.2 TOP: Probability of Compound Events

KEY: probability

185 ANS:

sample: pails of oranges; population: truckload of oranges. It is likely that about 5% of all the oranges are unsatisfactory.

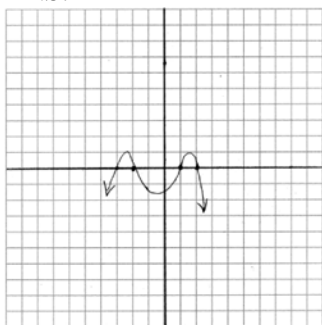
PTS: 2

REF: 011726aai

NAT: S.IC.A.2

TOP: Analysis of Data

186 ANS:



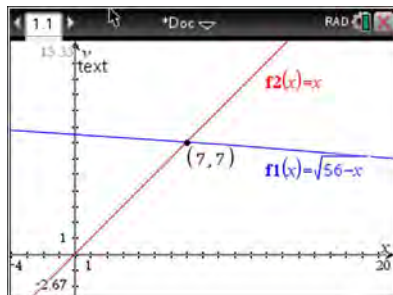
PTS: 2

REF: 011831aai

NAT: F.IF.C.7

TOP: Graphing Polynomial Functions

187 ANS: 3



$$\sqrt{56-x} = x$$

-8 is extraneous.

$$56-x = x^2$$

$$0 = x^2 + x - 56$$

$$0 = (x+8)(x-7)$$

$$x = 7$$

PTS: 2

REF: 061605aai

NAT: A.REI.A.2

TOP: Solving Radicals

KEY: extraneous solutions

188 ANS: 2

$$x^2 + 4x - 1 = x - 3 \quad y + 3 = -1$$

$$x^2 + 3x + 2 = 0 \quad y = -4$$

$$(x+2)(x+1) = 0$$

$$x = -2, -1$$

PTS: 2

REF: 061801aai

NAT: A.REI.C.7

TOP: Quadratic-Linear Systems

KEY: All

189 ANS: 3

$$d = 10 \log \frac{6.3 \times 10^{-3}}{1.0 \times 10^{-12}} \approx 98$$

PTS: 2 REF: 011715aai NAT: F.IF.B.4 TOP: Evaluating Logarithmic Expressions

190 ANS: 4 PTS: 2 REF: 061601aai NAT: N.RN.A.2

TOP: Radicals and Rational Exponents KEY: variables

191 ANS: 3 PTS: 2 REF: 061720aai NAT: F.LE.A.2

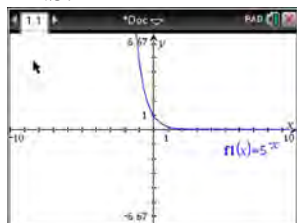
TOP: Sequences KEY: All

192 ANS:

$$(1-i)(1-i)(1-i) = (1-2i+i^2)(1-i) = -2i(1-i) = -2i+2i^2 = -2-2i$$

PTS: 2 REF: 011725aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

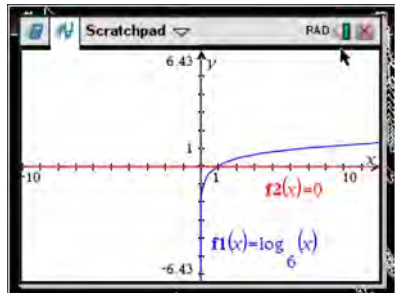
193 ANS: 4



$$y = 5^{-x} = \left(\frac{1}{5}\right)^x$$

PTS: 2 REF: 061615aai NAT: F.IF.C.7 TOP: Graphing Exponential Functions

194 ANS: 1



PTS: 2 REF: 061618aai NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions

195 ANS:

$$f(x) = x^2(x+4)(x-3); g(x) = (x+2)^2(x+6)(x-1)$$

PTS: 4 REF: 011836aai NAT: A.APR.B.3 TOP: Zeros of Polynomials

196 ANS: 2

The events are independent because  $P(A \text{ and } B) = P(A) \cdot P(B)$ .

$$0.125 = 0.5 \cdot 0.25$$

If  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = 0.25 + 0.5 - .125 = 0.625$ , then the events are not mutually exclusive because  $P(A \text{ or } B) = P(A) + P(B)$

$$0.625 \neq 0.5 + 0.25$$

PTS: 2

REF: 061714aai

NAT: S.CP.B.7

TOP: Theoretical Probability

197 ANS:

$$A = Pe^{rt}$$

$$135000 = 100000e^{5r}$$

$$1.35 = e^{5r}$$

$$\ln 1.35 = \ln e^{5r}$$

$$\ln 1.35 = 5r$$

$$.06 \approx r \text{ or } 6\%$$

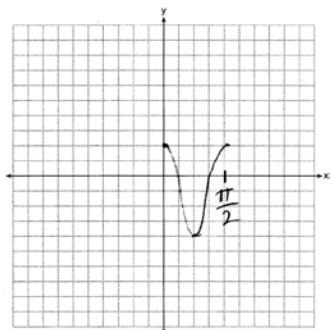
PTS: 2

REF: 061632aai

NAT: F.LE.A.4

TOP: Exponential Growth

198 ANS:



PTS: 2

REF: 061628aai

NAT: F.IF.C.7

TOP: Graphing Trigonometric Functions

KEY: graph

199 ANS:

$$0 = \sqrt{t} - 2t + 6 \quad 2\left(\frac{9}{4}\right) - 6 < 0, \text{ so } \frac{9}{4} \text{ is extraneous.}$$

$$2t - 6 = \sqrt{t}$$

$$4t^2 - 24t + 36 = t$$

$$4t^2 - 25t + 36 = 0$$

$$(4t - 9)(t - 4) = 0$$

$$t = \frac{9}{4}, 4$$

$$(\sqrt{1} - 2(1) + 6) - (\sqrt{3} - 2(3) + 6) = 5 - \sqrt{3} \approx 3.268 \quad 327 \text{ mph}$$

PTS: 6 REF: 011737aai NAT: A.REI.A.2 TOP: Solving Radicals

KEY: context

200 ANS:

$$\frac{1}{8} + \frac{1}{6} = \frac{1}{t_b}; \quad \frac{24t_b}{8} + \frac{24t_b}{6} = \frac{24t_b}{t_b}$$

$$3t_b + 4t_b = 24$$

$$t_b = \frac{24}{7} \approx 3.4$$

PTS: 2 REF: 011827aai NAT: A.CED.A.1 TOP: Modeling Rationals

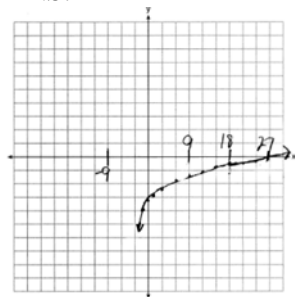
201 ANS:

$$\frac{47}{108} = \frac{1}{4} + \frac{116}{459} - P(M \text{ and } J); \text{ No, because } \frac{31}{459} \neq \frac{1}{4} \cdot \frac{116}{459}$$

$$P(M \text{ and } J) = \frac{31}{459}$$

PTS: 4 REF: 011834aai NAT: S.CP.A.3 TOP: Conditional Probability

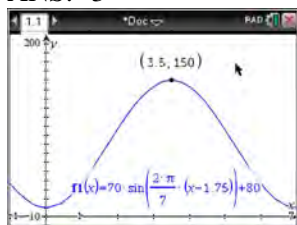
202 ANS:

As  $x \rightarrow -3, y \rightarrow -\infty$ . As  $x \rightarrow \infty, y \rightarrow \infty$ .

PTS: 4 REF: 061735aai NAT: F.IF.C.7 TOP: Graphing Logarithmic Functions



203 ANS: 3

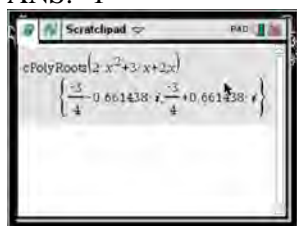


$H(t)$  is at a minimum at  $70(-1) + 80 = 10$

PTS: 2 REF: 061613aai NAT: F.IF.B.4 TOP: Graphing Trigonometric Functions  
KEY: maximum/minimum

204 ANS: 4 PTS: 2 REF: 011808aai NAT: A.SSE.B.3  
TOP: Modeling Exponential Functions KEY: All

205 ANS: 1



$$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(2)}}{2(2)} = \frac{-3 \pm \sqrt{-7}}{4} = -\frac{3}{4} \pm \frac{i\sqrt{7}}{4}$$

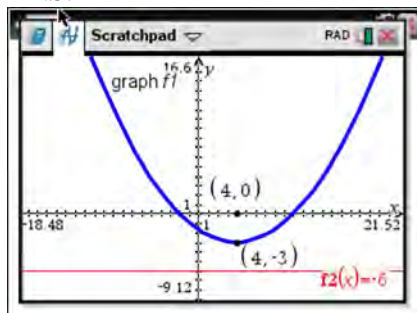
PTS: 2 REF: 061612aai NAT: A.REI.B.4 TOP: Solving Quadratics  
KEY: complex solutions | quadratic formula

206 ANS: 4

$$\frac{n}{m} = \frac{\sqrt{a^5}}{a} = \frac{a^{\frac{5}{2}}}{a^{\frac{2}{2}}} = a^{\frac{3}{2}} = \sqrt{a^3}$$

PTS: 2 REF: 011811aai NAT: N.RN.A.2 TOP: Radicals and Rational Exponents  
KEY: variables

207 ANS:



The vertex of the parabola is  $(4, -3)$ . The  $x$ -coordinate of the focus and the vertex is the same. Since the distance from the vertex to the directrix is 3, the distance from the vertex to the focus is 3, so the  $y$ -coordinate of the focus is 0. The coordinates of the focus are  $(4, 0)$ .

PTS: 2 REF: 061630aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

208 ANS: 1

In vertex form, the parabola is  $y = -\frac{1}{4(2)}(x+4)^2 + 3$ . The vertex is  $(-4,3)$  and  $p = 2$ .  $3 + 2 = 5$

PTS: 2 REF: 011816aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

209 ANS: 3

$$\frac{c^2 - d^2}{d^2 + cd - 2c^2} = \frac{(c+d)(c-d)}{(d+2c)(d-c)} = \frac{-(c+d)}{d+2c} = \frac{-c-d}{d+2c}$$

PTS: 2 REF: 011818aai NAT: A.APR.D.6 TOP: Rational Expressions

KEY: factoring

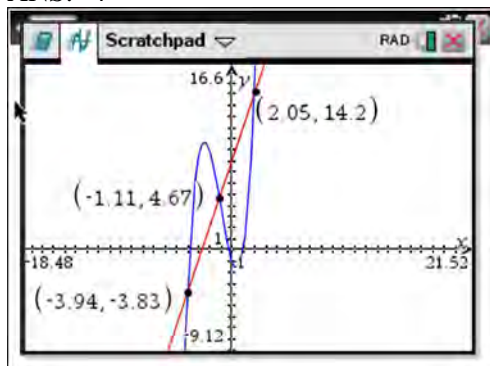
210 ANS: 2

$$4x \cdot x^{\frac{2}{3}} + 2x^{\frac{5}{3}} = 4x^{\frac{5}{3}} + 2x^{\frac{5}{3}} = 6x^{\frac{5}{3}} = 6\sqrt[3]{x^5}$$

PTS: 2 REF: 061820aai NAT: N.RN.A.2 TOP: Operations with Radicals

KEY: with variables, index &gt; 2

211 ANS: 4



PTS: 2 REF: 061622aai NAT: A.REI.D.11 TOP: Other Systems

KEY: All

212 ANS: 2

$$\begin{aligned} x(30 - 0.01x) - (0.15x^3 + 0.01x^2 + 2x + 120) &= 30x - 0.01x^2 - 0.15x^3 - 0.01x^2 - 2x - 120 \\ &= -0.15x^3 - 0.02x^2 + 28x - 120 \end{aligned}$$

PTS: 2 REF: 061709aai NAT: F.BF.A.1 TOP: Operations with Functions

213 ANS: 2



PTS: 2 REF: 061817aai NAT: S.ID.A.4 TOP: Normal Distributions  
KEY: probability

214 ANS:

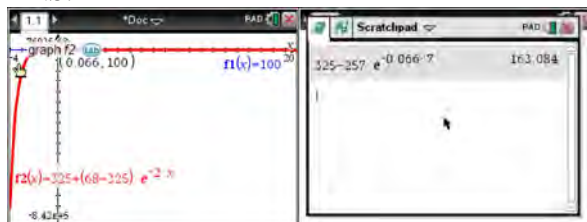
$$20000 = PMT \left( \frac{1 - (1 + 0.00625)^{-60}}{0.00625} \right) \quad 21000 - x = 300 \left( \frac{1 - (1 + 0.00625)^{-60}}{0.00625} \right)$$

$$PMT \approx 400.76$$

$$x \approx 6028$$

PTS: 4 REF: 011736aai NAT: A.SSE.B.4 TOP: Series

215 ANS:



$$100 = 325 + (68 - 325)e^{-2k} \quad T = 325 - 257e^{-0.066t}$$

$$-225 = -257e^{-2k}$$

$$T = 325 - 257e^{-0.066(7)} \approx 163$$

$$k = \frac{\ln\left(\frac{-225}{-257}\right)}{-2}$$

$$k \approx 0.066$$

PTS: 4 REF: fall1513aai NAT: F.LE.A.4 TOP: Exponential Growth

216 ANS: 3

$$1.0525^{\frac{1}{12}} \approx 1.00427$$

PTS: 2 REF: 061621aai NAT: F.BF.A.1 TOP: Modeling Exponential Functions  
KEY: All

217 ANS:

$0.602 \pm 2 \cdot 0.066 = 0.47 - 0.73$ . Since 0.50 falls within the 95% interval, this supports the concern there may be an even split.

PTS: 4 REF: 061635aai NAT: S.IC.B.5 TOP: Analysis of Data

218 ANS: 3

$$(x + 3i)^2 - (2x - 3i)^2 = x^2 + 6xi + 9i^2 - (4x^2 - 12xi + 9i^2) = -3x^2 - 18xi$$

PTS: 2 REF: 061805aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers

219 ANS:

$$M = 172600 \cdot \frac{0.00305(1 + 0.00305)^{12 \cdot 15}}{(1 + 0.00305)^{12 \cdot 15} - 1} \approx 1247 \quad 1100 = (172600 - x) \cdot \frac{0.00305(1 + 0.00305)^{12 \cdot 15}}{(1 + 0.00305)^{12 \cdot 15} - 1}$$

$$1100 \approx (172600 - x) \cdot (0.007228)$$

$$152193 \approx 172600 - x$$

$$20407 \approx x$$

PTS: 4 REF: 061734aai NAT: A.SSE.B.4 TOP: Series

220 ANS: 4

The vertex is  $(2, -1)$  and  $p = 2$ .  $y = -\frac{1}{4(2)}(x - 2)^2 - 1$

PTS: 2 REF: 081619aai NAT: G.GPE.A.2 TOP: Graphing Quadratic Functions

221 ANS:

$$\frac{f(4) - f(-2)}{4 - (-2)} = \frac{80 - 1.25}{6} = 13.125 \quad g(x) \text{ has a greater rate of change}$$

$$\frac{g(4) - g(-2)}{4 - (-2)} = \frac{179 - (-49)}{6} = 38$$

PTS: 4 REF: 061636aai NAT: F.IF.C.9 TOP: Comparing Functions

KEY: All

222 ANS:

$$\frac{103}{110 + 103} = \frac{103}{213}$$

PTS: 2 REF: 061825aai NAT: S.CP.A.4 TOP: Conditional Probability

223 ANS: 2

$$x = -6(y - 2)$$

$$-\frac{x}{6} = y - 2$$

$$-\frac{x}{6} + 2 = y$$

PTS: 2 REF: 011821aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: linear

224 ANS:

$$\begin{aligned} & (2x^2 + x - 3) \cdot (x - 1) - \left[ (2x^2 + x - 3) + (x - 1) \right] \\ & (2x^3 - 2x^2 + x^2 - x - 3x + 3) - (2x^2 + 2x - 4) \\ & 2x^3 - 3x^2 - 6x + 7 \end{aligned}$$

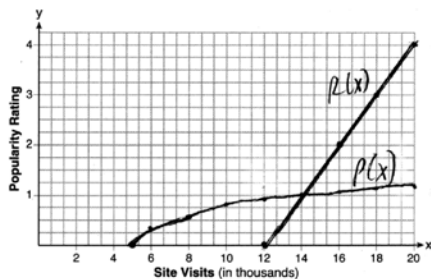
PTS: 4

REF: 011833aii

NAT: F.BF.A.1

TOP: Operations with Functions

225 ANS:



$$P(16) = \log(16 - 4) \approx 1.1, \quad , 14000$$

PTS: 6

REF: 061837aii

NAT: A.REI.D.11

TOP: Other Systems

KEY: AII

226 ANS:

$$P(P/K) = \frac{P(P \wedge K)}{P(K)} = \frac{1.9}{2.3} \approx 82.6\% \quad \text{A key club member has an 82.6\% probability of being enrolled in AP Physics.}$$

PTS: 4

REF: 011735aii

NAT: S.CP.B.6

TOP: Conditional Probability

227 ANS: 2

PTS: 2

REF: 061802aii

NAT: F.IF.C.7

TOP: Graphing Exponential Functions

KEY: AII

228 ANS: 2

PTS: 2

REF: 061724aii

NAT: A.SSE.B.4

TOP: Series

229 ANS: 1

$$(1) \frac{9-0}{2-1} = 9 \quad (2) \frac{17-0}{3.5-1} = 6.8 \quad (3) \frac{0-0}{5-1} = 0 \quad (4) \frac{17--5}{3.5-1} \approx 6.3$$

PTS: 2

REF: 011724aii

NAT: F.IF.B.6

TOP: Rate of Change

KEY: AII

230 ANS: 3

PTS: 2

REF: 061602aii

NAT: A.CED.A.1

TOP: Modeling Rationals

231 ANS: 4

1 year = 365 days

PTS: 2

REF: 061823aii

NAT: A.SSE.B.3

TOP: Modeling Exponential Functions

KEY: AII

232 ANS:

$23 - 18 = 5$ ,  $\bar{x} \pm 2\sigma = -3.07 - 3.13$ , Yes, a difference of 5 or more occurred three times out of a thousand, which is statistically significant.

PTS: 4

REF: 061834aii

NAT: S.IC.B.5

TOP: Analysis of Data

233 ANS: 2 PTS: 2 REF: 061620aai NAT: F.IF.B.4  
TOP: Graphing Polynomial Functions

234 ANS:  
 $i^2 = -1$ , and not 1;  $10 + 10i$

PTS: 2 REF: 011825aai NAT: N.CN.A.2 TOP: Operations with Complex Numbers  
235 ANS: 3  
(3) repeats 3 times over  $2\pi$ .

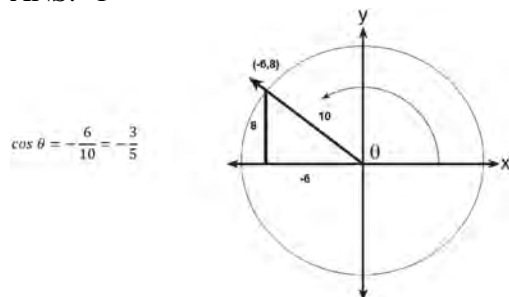
PTS: 2 REF: 011722aai NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions  
KEY: recognize | bimodalgraph

236 ANS:  

$$\begin{array}{r} 3x + 13 \\ x - 2 \overline{) 3x^2 + 7x - 20} \quad 3x + 13 + \frac{6}{x - 2} \\ \underline{3x^2 - 6x} \phantom{- 20} \\ 13x - 20 \\ \underline{13x - 26} \\ 6 \end{array}$$

PTS: 2 REF: 011732aai NAT: A.APR.D.6 TOP: Division of Polynomials  
237 ANS: 1  
The probability of rain equals the probability of rain, given that Sean pitches.

PTS: 2 REF: 061611aai NAT: S.CP.A.3 TOP: Conditional Probability  
238 ANS: 1



PTS: 2 REF: 061617aai NAT: F.TF.A.2 TOP: Determining Trigonometric Functions  
KEY: extension to reals

239 ANS: 4

$$y = g(x) = (x-2)^2 \quad (x-2)^2 = 3x-2 \quad y = 3(6)-2 = 16$$

$$x^2 - 4x + 4 = 3x - 2 \quad y = 3(1) - 2 = 1$$

$$x^2 - 7x + 6 = 0$$

$$(x-6)(x-1) = 0$$

$$x = 6, 1$$

PTS: 2 REF: 011705aia NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

KEY: AII

240 ANS: 2

PTS: 2

REF: 061816aia

NAT: F.IF.C.7

TOP: Graphing Polynomial Functions

KEY: bimodalgraph

241 ANS:

$$\sqrt{x-4} = -x+6 \quad \sqrt{x-4} = -8+6 = -2 \text{ is extraneous.}$$

$$x-4 = x^2 - 12x + 36$$

$$0 = x^2 - 13x + 40$$

$$0 = (x-8)(x-5)$$

$$x = 5, 8$$

PTS: 2

REF: 061730aia

NAT: A.REI.A.2

TOP: Solving Radicals

KEY: extraneous solutions

242 ANS:

The denominator of the rational exponent represents the index of a root, and the 4th root of 81 is 3 and  $3^3$  is 27.

PTS: 2

REF: 011832aia

NAT: N.RN.A.1

TOP: Radicals and Rational Exponents

243 ANS: 3

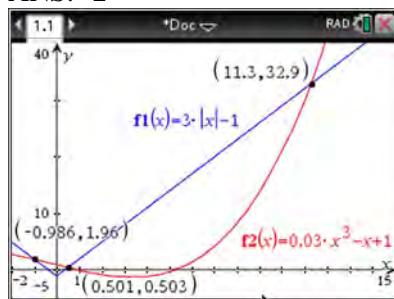
PTS: 2

REF: 061710aia

NAT: S.IC.A.2

TOP: Analysis of Data

244 ANS: 2



PTS: 2

REF: 061705aia

NAT: A.REI.D.11

TOP: Other Systems

KEY: AII

245 ANS: 2

PTS: 2

REF: 011701aia

NAT: F.IF.B.4

TOP: Graphing Trigonometric Functions

246 ANS:

$$\sqrt{6-2x} + x = 2x + 30 - 9 \quad \sqrt{6-2(-29)} \neq -29 + 21, \text{ so } -29 \text{ is extraneous.}$$

$$\sqrt{6-2x} = x + 21 \quad \sqrt{64} \neq -8$$

$$6 - 2x = x^2 + 42x + 441$$

$$x^2 + 44x + 435 = 0$$

$$(x + 29)(x + 15) = 0$$

$$x = -29, -15$$

PTS: 2 REF: 061833aai NAT: A.REI.A.2 TOP: Solving Radicals

KEY: extraneous solutions

247 ANS:

Jillian's plan, because distance increases by one mile each week.  $a_1 = 10$   $a_n = n + 12$ 

$$a_n = a_{n-1} + 1$$

PTS: 4 REF: 011734aai NAT: F.LE.A.2 TOP: Sequences

248 ANS: 3

$$y = x^3 - 2$$

$$x = y^3 - 2$$

$$x + 2 = y^3$$

$$\sqrt[3]{x+2} = y$$

PTS: 2 REF: 061815aai NAT: F.BF.B.4 TOP: Inverse of Functions

KEY: other

249 ANS: 4

There is no  $x$ -intercept.

PTS: 2 REF: 011823aai NAT: F.IF.C.7 TOP: Graphing Exponential Functions

KEY: All

250 ANS: 1

$$(x+7)(x-1) = x^2 + 6x - 7 = x^2 + 6x + 9 - 7 - 9 = (x+3)^2 - 16$$

PTS: 2 REF: 061808aai NAT: A.APR.C.4 TOP: Polynomial Identities

251 ANS:

$$S_n = \frac{33000 - 33000(1.04)^n}{1 - 1.04} \quad S_{15} = \frac{33000 - 33000(1.04)^{15}}{1 - 1.04} \approx 660778.39$$

PTS: 4 REF: 061634aai NAT: A.SSE.B.4 TOP: Series



252 ANS:



69

PTS: 2 REF: 061726aai NAT: S.ID.A.4 TOP: Normal Distributions

KEY: percent

253 ANS: 1

$$d = 18; r = \pm \frac{5}{4}$$

PTS: 2 REF: 011714aai NAT: F.IF.A.3 TOP: Sequences

KEY: term

254 ANS: 4

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4(6)(29)}}{2(6)} = \frac{8 \pm \sqrt{-632}}{12} = \frac{8 \pm i\sqrt{4}\sqrt{158}}{12} = \frac{2}{3} \pm \frac{1}{6}i\sqrt{158}$$

PTS: 2 REF: 011711aai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: complex solutions | quadratic formula

255 ANS:

$\csc \theta = \frac{1}{\sin \theta}$ , and  $\sin \theta$  on a unit circle represents the  $y$  value of a point on the unit circle. Since  $y = \sin \theta$ ,

$$\csc \theta = \frac{1}{y}.$$

PTS: 2 REF: 011727aai NAT: F.TF.A.2 TOP: Reciprocal Trigonometric Relationships

256 ANS: 4

$$\begin{array}{r} 5x^2 + x - 3 \\ 2x - 1 \overline{) 10x^3 - 3x^2 - 7x + 3} \\ \underline{10x^3 - 5x^2} \phantom{+ 3} \\ 2x^2 - 7x \phantom{+ 3} \\ \underline{2x^2 - x} \phantom{+ 3} \\ -6x + 3 \\ \underline{-6x + 3} \\ 0 \end{array}$$

PTS: 2 REF: 011809aai NAT: A.APR.D.6 TOP: Division of Polynomials

257 ANS: 2

The 2010 population is 110 million.

PTS: 2

REF: 061718aai

NAT: F.LE.B.5

TOP: Modeling Exponential Functions

258 ANS: 2

PTS: 2

REF: 011806aai

NAT: A.APR.C.4

TOP: Polynomial Identities

259 ANS: 2

$$x = -\frac{3}{4}y + 2$$

$$-4x = 3y - 8$$

$$-4x + 8 = 3y$$

$$-\frac{4}{3}x + \frac{8}{3} = y$$

PTS: 2

REF: 061616aai

NAT: F.BF.B.4

TOP: Inverse of Functions

KEY: linear

260 ANS: 1

$$8(2^{x+3}) = 48$$

$$2^{x+3} = 6$$

$$(x+3)\ln 2 = \ln 6$$

$$x+3 = \frac{\ln 6}{\ln 2}$$

$$x = \frac{\ln 6}{\ln 2} - 3$$

PTS: 2

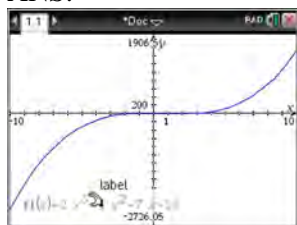
REF: 061702aai

NAT: F.LE.A.4

TOP: Exponential Equations

KEY: without common base

261 ANS:



$$x - 5 \overline{) 2x^3 - 4x^2 - 7x - 10} \quad \begin{array}{l} 2x^2 + 6x + 23 \\ \hline \end{array} \quad \text{Since there is a remainder, } x - 5 \text{ is not a factor.}$$

$$\underline{2x^3 - 10x^2}$$

$$6x^2 - 7x$$

$$\underline{6x^2 - 30x}$$

$$23x - 10$$

$$\underline{23x - 115}$$

$$105$$

PTS: 2 REF: 061627aia NAT: A.APR.B.2 TOP: Remainder Theorem

262 ANS: 3

Self selection causes bias.

PTS: 2 REF: 061703aia NAT: S.IC.B.3 TOP: Analysis of Data

KEY: bias

263 ANS: 4

$$\text{period} = \frac{2\pi}{B}$$

$$\frac{1}{60} = \frac{2\pi}{B}$$

$$B = 120\pi$$

PTS: 2 REF: 061624aia NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

264 ANS:

$$\frac{x^3 + 9}{x^3 + 8} = \frac{x^3 + 8}{x^3 + 8} + \frac{1}{x^3 + 8}$$

$$\frac{x^3 + 9}{x^3 + 8} = \frac{x^3 + 9}{x^3 + 8}$$

PTS: 2 REF: 061631aia NAT: A.APR.C.4 TOP: Polynomial Identities

265 ANS:

 $0.506 \pm 2 \cdot 0.078 = 0.35 - 0.66$ . The 32.5% value falls below the 95% confidence level.

PTS: 4 REF: 061736aia NAT: S.IC.B.5 TOP: Analysis of Data

266 ANS: 2

$$\begin{array}{r}
 2x^2 - 3x + 7 \\
 2x + 3 \overline{) 4x^3 + 0x^2 + 5x + 10} \\
 \underline{4x^3 + 6x^2} \phantom{+ 5x + 10} \\
 -6x^2 + 5x \phantom{+ 10} \\
 \underline{-6x^2 - 9x} \phantom{+ 10} \\
 14x + 10 \\
 \underline{14x + 21} \\
 -11
 \end{array}$$

PTS: 2 REF: 061614aai NAT: A.APR.D.6 TOP: Rational Expressions  
 KEY: division

267 ANS:

$$x = \frac{-5 \pm \sqrt{5^2 + 4(2)(8)}}{2(2)} = -\frac{5}{4} \pm \frac{i\sqrt{39}}{4}$$

PTS: 2 REF: 061827aai NAT: A.REI.B.4 TOP: Solving Quadratics  
 KEY: complex solutions | quadratic formula

268 ANS: 1

$$\begin{aligned}
 100 \left( \frac{1}{2} \right)^{\frac{d}{8}} &= 100e^{kd} \\
 \left( \frac{1}{2} \right)^{\frac{1}{8}} &= e^k \\
 k &\approx -0.087
 \end{aligned}$$

PTS: 2 REF: 061818aai NAT: A.SSE.B.3 TOP: Modeling Exponential Functions  
 KEY: All

269 ANS: 3

The graph shows three real zeros, and has end behavior matching the given end behavior.

PTS: 2 REF: 061604aai NAT: F.IF.C.7 TOP: Graphing Polynomial Functions  
 KEY: bimodalgraph

270 ANS:

$$\begin{aligned}
 2x^3 - 10x^2 + 11x - 7 &= 2x^3 + hx^2 + 3x - 8x^2 - 4hx - 12 + k & h &= -2 \\
 -2x^2 + 8x + 5 &= hx^2 - 4hx + k & k &= 5
 \end{aligned}$$

PTS: 4 REF: 011733aai NAT: A.APR.C.4 TOP: Polynomial Identities

271 ANS:

$$P(S \cap M) = P(S) + P(M) - P(S \cup M) = \frac{649}{1376} + \frac{433}{1376} - \frac{974}{1376} = \frac{108}{1376}$$

PTS: 2 REF: 061629aai NAT: S.CP.B.7 TOP: Theoretical Probability

272 ANS: 1

$$\frac{2(x-4)}{(x+3)(x-4)} + \frac{3(x+3)}{(x-4)(x+3)} = \frac{2x-2}{x^2-x-12}$$

$$2x - 8 + 3x + 9 = 2x - 2$$

$$3x = -3$$

$$x = -1$$

PTS: 2 REF: 011717aai NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

273 ANS:

$$3x^3 + x^2 + 3xy + y = x^2(3x+1) + y(3x+1) = (x^2 + y)(3x+1)$$

PTS: 2 REF: 011828aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

274 ANS:

$\left(\ln \frac{1}{2}\right)$   
1590 is negative, so  $M(t)$  represents decay.

PTS: 2 REF: 011728aai NAT: F.IF.C.7 TOP: Graphing Exponential Functions

275 ANS:

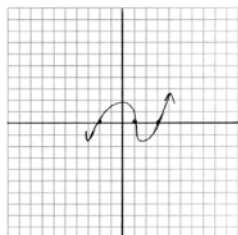
No, because  $P(M/R) \neq P(M)$ 

$$\frac{70}{180} \neq \frac{230}{490}$$

$$0.38 \neq 0.47$$

PTS: 2 REF: 011731aai NAT: S.CP.A.4 TOP: Conditional Probability

276 ANS:



PTS: 2 REF: 011729aai NAT: F.IF.C.7 TOP: Graphing Polynomial Functions

277 ANS:

$$\left(x^{\frac{5}{3}}\right)^{\frac{6}{5}} = \left(y^{\frac{5}{6}}\right)^{\frac{6}{5}}$$

$$x^2 = y$$

PTS: 2 REF: 011730aii NAT: N.RN.A.2 TOP: Radicals and Rational Exponents  
KEY: variables

278 ANS:

$r(2) = -6$ . Since there is a remainder when the cubic is divided by  $x - 2$ , this binomial is not a factor.

$$\begin{array}{r|rrrr} 2 & 1 & -4 & 4 & 6 \\ & & 2 & -4 & 0 \\ \hline & 1 & -2 & 0 & -6 \end{array}$$

PTS: 2 REF: 061725aii NAT: A.APR.B.2 TOP: Remainder Theorem

279 ANS: 1

$$\frac{N(10) - N(1)}{10 - 1} \approx -2.03, \frac{N(20) - N(10)}{20 - 10} \approx -1.63, \frac{N(25) - N(15)}{25 - 15} \approx -1.46, \frac{N(30) - N(1)}{30 - 1} \approx -1.64$$

PTS: 2 REF: 061807aii NAT: F.IF.B.6 TOP: Rate of Change  
KEY: All

280 ANS:

$$\begin{array}{l} x + y + z = 1 \quad 2x + 2y + 2z = 2 \quad -2z - z = 3 \quad y - (-1) = 3 \quad x + 2 - 1 = 1 \\ \underline{-x + 3y - 5z = 11} \quad \underline{2x + 4y + 6z = 2} \quad -3z = 3 \quad y = 2 \quad x = 0 \\ 4y - 4z = 12 \quad 2y + 4z = 0 \quad z = -1 \\ y - z = 3 \quad y + 2z = 0 \\ y = -2z \end{array}$$

PTS: 4 REF: 061733aii NAT: A.REI.C.6 TOP: Solving Linear Systems  
KEY: three variables

281 ANS:

Randomly assign participants to two groups. One group uses the toothpaste with ingredient  $X$  and the other group uses the toothpaste without ingredient  $X$ .

PTS: 2 REF: 061626aii NAT: S.IC.B.3 TOP: Analysis of Data  
KEY: type

282 ANS: 4

$$a = \frac{14 - 4}{2} = 5, d = \frac{14 + 4}{2} = 9$$

PTS: 2 REF: 061810aii NAT: F.TF.B.5 TOP: Modeling Trigonometric Functions

283 ANS: 4

$$\frac{2}{x} = \frac{4x}{x+3}$$

$$2x+6 = 4x^2$$

$$4x^2 - 2x - 6 = 0$$

$$2(2x^2 - x - 3) = 0$$

$$(2x-3)(x+1) = 0$$

$$x = \frac{3}{2}, -1$$

PTS: 2 REF: 061809aai NAT: A.REI.A.2 TOP: Solving Rationals

284 ANS: 1

$$\frac{157}{25+47+157}$$

PTS: 2 REF: 081607aai NAT: S.CP.A.4 TOP: Conditional Probability

285 ANS: 1

$$1240(1.06)^x = 890(1.11)^x$$

$$x \approx 7$$

PTS: 2 REF: 061814aai NAT: A.REI.D.11 TOP: Other Systems

KEY: All

286 ANS: 4

$$(a+b+c)^2 = a^2 + ab + ac + ab + b^2 + bc + ac + ab + c^2$$

$$x = a^2 + b^2 + c^2 + 2(ab + bc + ac)$$

$$x = y + 2z$$

PTS: 2 REF: 061822aai NAT: A.APR.C.4 TOP: Polynomial Identities

287 ANS: 3

$$\frac{f(7) - f(-7)}{7 - (-7)} = \frac{2^{-0.25(7)} \bullet \sin\left(\frac{\pi}{2}(7)\right) - 2^{-0.25(-7)} \bullet \sin\left(\frac{\pi}{2}(-7)\right)}{14} \approx -0.26$$

PTS: 2 REF: 061721aai NAT: F.IF.B.6 TOP: Rate of Change

KEY: All

288 ANS: 4

$$3x - (-2x + 14) = 16 \quad 3(6) - 4z = 2$$

$$5x = 30 \quad -4z = -16$$

$$x = 6 \quad z = 4$$

PTS: 2 REF: 011803aai NAT: A.REI.C.6 TOP: Solving Linear Systems

KEY: three variables

289 ANS: 3

PTS: 2

REF: 011710aai

NAT: F.BF.A.1

TOP: Operations with Functions

290 ANS: 4

$$(1) \frac{B(60) - B(10)}{60 - 10} \approx 28\% \quad (2) \frac{B(69) - B(19)}{69 - 19} \approx 33\% \quad (3) \frac{B(72) - B(36)}{72 - 36} \approx 38\% \quad (4) \frac{B(73) - B(60)}{73 - 60} \approx 46\%$$

PTS: 2

REF: 011721aai

NAT: F.IF.B.6

TOP: Rate of Change

KEY: All

291 ANS: 4

The vertex is (1,0) and  $p = 2$ .  $y = \frac{1}{4(2)}(x - 1)^2 + 0$

PTS: 2

REF: 061717aai

NAT: G.GPE.A.2

TOP: Graphing Quadratic Functions

292 ANS: 2



$\bar{x} + 2\sigma$  represents approximately 48% of the data.

PTS: 2

REF: 061609aai

NAT: S.ID.A.4

TOP: Normal Distributions

KEY: percent

293 ANS: 1

PTS: 2

REF: 011815aai

NAT: F.TF.A.2

TOP: Unit Circle

294 ANS: 2

$$f(x) = f(-x)$$

$$x^2 - 4 = (-x)^2 - 4$$

$$x^2 - 4 = x^2 - 4$$

PTS: 2

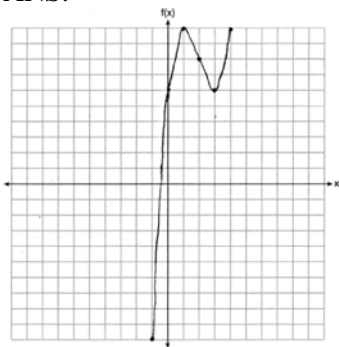
REF: 061806aai

NAT: F.BF.B.3

TOP: Even and Odd Functions



295 ANS:



- PTS: 2 REF: 061826aai NAT: F.IF.C.7 TOP: Graphing Polynomial Functions  
 296 ANS: 3 PTS: 2 REF: 061824aai NAT: A.CED.A.1  
 TOP: Modeling Rationals  
 297 ANS: 2 PTS: 2 REF: 061804aai NAT: S.ID.B.6  
 TOP: Regression KEY: choose model  
 298 ANS: 1

$$x - \frac{4}{x-1} = 2 \quad x = \frac{3 \pm \sqrt{(-3)^2 - 4(1)(-2)}}{2(1)} = \frac{3 \pm \sqrt{17}}{2}$$

$$x(x-1) - 4 = 2(x-1)$$

$$x^2 - x - 4 = 2x - 2$$

$$x^2 - 3x - 2 = 0$$

- PTS: 2 REF: 011812aai NAT: A.REI.A.2 TOP: Solving Rationals  
 KEY: rational solutions  
 299 ANS: 3  
 The pattern suggests an exponential pattern, not linear or sinusoidal. A 4% growth rate is accurate, while a 43% growth rate is not.

- PTS: 2 REF: 011713aai NAT: S.ID.B.6 TOP: Regression  
 KEY: choose model  
 300 ANS: 1

$$\frac{2x}{x-2} \left( \frac{x}{x} \right) - \frac{11}{x} \left( \frac{x-2}{x-2} \right) = \frac{8}{x^2 - 2x}$$

$$2x^2 - 11x + 22 = 8$$

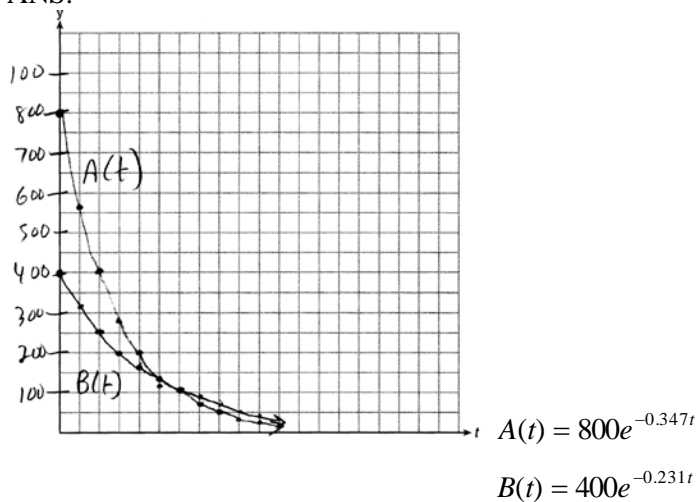
$$2x^2 - 11x + 14 = 0$$

$$(2x-7)(x-2) = 0$$

$$x = \frac{7}{2}, 2$$

- PTS: 2 REF: 061719aai NAT: A.REI.A.2 TOP: Solving Rationals

301 ANS:



$$800e^{-0.347t} = 400e^{-0.231t} \quad 0.15 = e^{-0.347t}$$

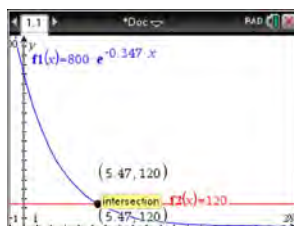
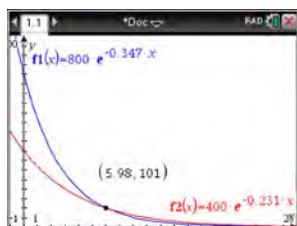
$$\ln 2e^{-0.347t} = \ln e^{-0.231t} \quad \ln 0.15 = \ln e^{-0.347t}$$

$$\ln 2 + \ln e^{-0.347t} = \ln e^{-0.231t} \quad \ln 0.15 = -0.347t \cdot \ln e$$

$$\ln 2 - 0.347t = -0.231t \quad 5.5 \approx t$$

$$\ln 2 = 0.116t$$

$$6 \approx t$$



PTS: 6 REF: 061637aia NAT: A.REI.D.11 TOP: Other Systems

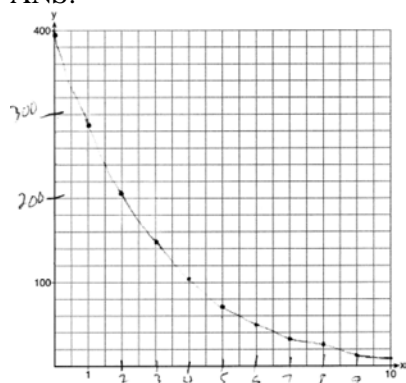
KEY: AII

302 ANS:

A student is more likely to jog if both siblings jog. 1 jogs:  $\frac{416}{2239} \approx 0.19$ . both jog:  $\frac{400}{1780} \approx 0.22$

PTS: 2 REF: 061732aia NAT: S.CP.A.4 TOP: Conditional Probability

303 ANS:



PTS: 2

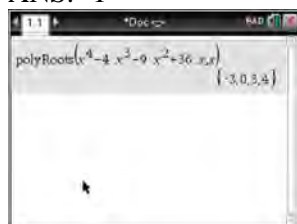
REF: 061729aai

NAT: F.IF.C.7

TOP: Graphing Exponential Functions

KEY: AII

304 ANS: 1



$$x^4 - 4x^3 - 9x^2 + 36x = 0$$

$$x^3(x - 4) - 9x(x - 4) = 0$$

$$(x^3 - 9x)(x - 4) = 0$$

$$x(x^2 - 9)(x - 4) = 0$$

$$x(x + 3)(x - 3)(x - 4) = 0$$

$$x = 0, \pm 3, 4$$

PTS: 2

REF: 061606aai

NAT: A.APR.B.3

TOP: Zeros of Polynomials

KEY: AII

305 ANS: 4

	Bar Harbor	Phoenix
<b>Minimum</b>	31.386	66.491
<b>Midline</b>	55.3	86.729
<b>Maximum</b>	79.214	106.967
<b>Range</b>	47.828	40.476

PTS: 2

REF: 061715aai

NAT: F.IF.B.4

TOP: Graphing Trigonometric Functions

KEY: maximum/minimum

306 ANS: 3

$$1^3 - k(1)^2 + 2(1) = 0$$

$$k = 3$$

PTS: 2

REF: 061812aai

NAT: A.APR.B.3

TOP: Zeros of Polynomials

KEY: AII

307 ANS:

$$100 = 140 \left( \frac{1}{2} \right)^{\frac{5}{h}} \quad \log \frac{100}{140} = \log \left( \frac{1}{2} \right)^{\frac{5}{h}} \quad 40 = 140 \left( \frac{1}{2} \right)^{\frac{t}{10.3002}}$$

$$\log \frac{5}{7} = \frac{5}{h} \log \frac{1}{2} \quad \log \frac{2}{7} = \log \left( \frac{1}{2} \right)^{\frac{t}{10.3002}}$$

$$h = \frac{5 \log \frac{1}{2}}{\log \frac{5}{7}} \approx 10.3002 \quad \log \frac{2}{7} = \frac{t \log \left( \frac{1}{2} \right)}{10.3002}$$

$$t = \frac{10.3002 \log \frac{2}{7}}{\log \frac{1}{2}} \approx 18.6$$

PTS: 6

REF: 061737aai

NAT: F.LE.A.4

TOP: Exponential Decay

308 ANS: 2

$$6xi^3(-4xi+5) = -24x^2i^4 + 30xi^3 = -24x^2(1) + 30x(-1) = -24x^2 - 30xi$$

PTS: 2

REF: 061704aai

NAT: N.CN.A.2

TOP: Operations with Complex Numbers

309 ANS: 4

$$\frac{5+9}{2} = 7, \text{ vertex: } (-2, 7); p = 7 - 9 = -2, y = \frac{1}{4(-2)}(x+2)^2 + 7$$

$$y - 7 = \frac{1}{-8}(x+2)^2$$

$$-8(y - 7) = (x+2)^2$$

PTS: 2

REF: 061821aai

NAT: G.GPE.A.2

TOP: Graphing Quadratic Functions

310 ANS: 4

PTS: 2

REF: 061706aai

NAT: F.IF.B.4

TOP: Graphing Trigonometric Functions

311 ANS:

$$\frac{-1}{\sqrt{2^2 + (-1)^2}} = -\frac{1}{\sqrt{5}}$$

PTS: 2

REF: 061832aai

NAT: F.TF.A.2

TOP: Determining Trigonometric Functions

KEY: extension to reals

312 ANS: 4                   PTS: 2                   REF: 011801aii           NAT: S.IC.B.3  
TOP: Analysis of Data                   KEY: bias

313 ANS: 2

$$(2 - yi)(2 - yi) = 4 - 4yi + y^2 i^2 = -y^2 - 4yi + 4$$

PTS: 2                   REF: 061603aii           NAT: N.CN.A.2           TOP: Operations with Complex Numbers

314 ANS:

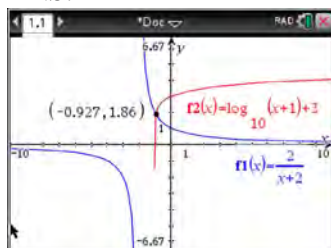
$$\begin{array}{r} 2a^2 + 5a + 2 \\ 3a - 2 \overline{) 6a^3 + 11a^2 - 4a - 9} \quad 2a^2 + 5a + 2 - \frac{5}{3a - 2} \\ \underline{6a^3 - 4a^2} \phantom{- 9} \\ 15a^2 - 4a \phantom{- 9} \\ \underline{15a^2 - 10a} \phantom{- 9} \\ 6a - 9 \\ \underline{6a - 4} \\ -5 \end{array}$$

PTS: 2                   REF: 061829aii           NAT: A.APR.D.6           TOP: Division of Polynomials

315 ANS: 2                   PTS: 2                   REF: 011720aii           NAT: A.APR.B.2  
TOP: Remainder Theorem

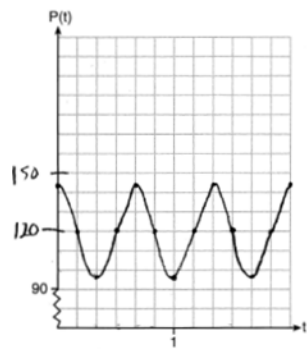
316 ANS: 1                   PTS: 2                   REF: 061701aii           NAT: A.APR.B.3  
TOP: Zeros of Polynomials           KEY: AII

317 ANS: 2



PTS: 2                   REF: 011712aii           NAT: A.REI.D.11           TOP: Other Systems  
KEY: AII

318 ANS:

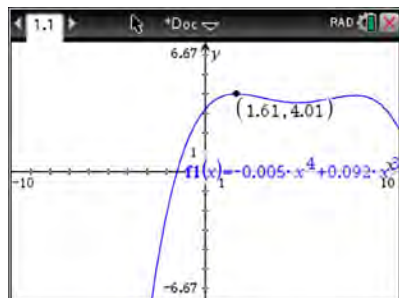


The period of  $P$  is  $\frac{2}{3}$ , which means the patient's blood pressure reaches a high every  $\frac{2}{3}$  second and a low every  $\frac{2}{3}$  second. The patient's blood pressure is high because 144 over 96 is greater than 120 over 80.

PTS: 6 REF: 011837aia NAT: F.IF.C.7 TOP: Graphing Trigonometric Functions  
KEY: graph

319 ANS: 2 PTS: 2 REF: 011709aia NAT: S.IC.B.5  
TOP: Analysis of Data

320 ANS: 3



PTS: 2 REF: 011817aia NAT: F.IF.B.4 TOP: Graphing Polynomial Functions

321 ANS: 3

$$\sqrt{x+1} = x+1$$

$$x+1 = x^2 + 2x + 1$$

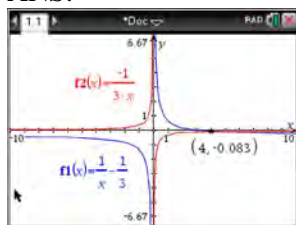
$$0 = x^2 + x$$

$$0 = x(x+1)$$

$$x = -1, 0$$

PTS: 2 REF: 011802aia NAT: A.REI.A.2 TOP: Solving Radicals  
KEY: extraneous solutions

322 ANS:



$$\frac{1}{x} - \frac{1}{3} = -\frac{1}{3x}$$

$$\frac{3-x}{3x} = -\frac{1}{3x}$$

$$3-x = -1$$

$$x = 4$$

PTS: 2 REF: 061625aai NAT: A.REI.A.2 TOP: Solving Rationals

KEY: rational solutions

323 ANS: 3 PTS: 2 REF: 011706aai NAT: S.IC.B.3

TOP: Analysis of Data

KEY: type

324 ANS: 1 PTS: 2 REF: 011814aai NAT: A.REI.D.11

TOP: Other Systems

KEY: All

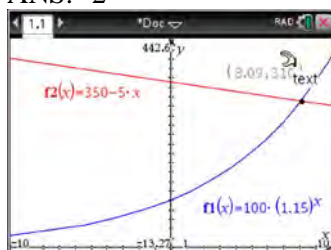
325 ANS:

$$x^2(4x-1) + 4(4x-1) = (x^2+4)(4x-1)$$

PTS: 2 REF: 061727aai NAT: A.SSE.A.2 TOP: Factoring Polynomials

KEY: factoring by grouping

326 ANS: 2



PTS: 2 REF: 011716aai NAT: A.REI.D.11 TOP: Other Systems

KEY: All

327 ANS: 3 PTS: 2 REF: 061623aai NAT: F.BF.A.2

TOP: Sequences