ALGEBRA

II

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II

Wednesday, August 16, 2017 — 12:30 to 3:30 p.m., only

Student Name ____

School Name ____

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Print your name and the name of your school on the lines above.

A separate answer sheet for **Part I** has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

This examination has four parts, with a total of 37 questions. You must answer all questions in this examination. Record your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in **Parts II**, **III**, and **IV** directly in this booklet. All work should be written in pen, except for graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale.

The formulas that you may need to answer some questions in this examination are found at the end of the examination. This sheet is perforated so you may remove it from this booklet.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper. A perforated sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. You may remove this sheet from this booklet. Any work done on this sheet of scrap graph paper will not be scored.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

Notice …

A graphing calculator and a straightedge (ruler) must be available for you to use while taking this examination.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet. [48]

Use this space for computations.

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

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

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

3 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 $-1 - 4i$

4 The solution set for the equation $\sqrt{x + 14} - \sqrt{2x + 5} = 1$ is

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

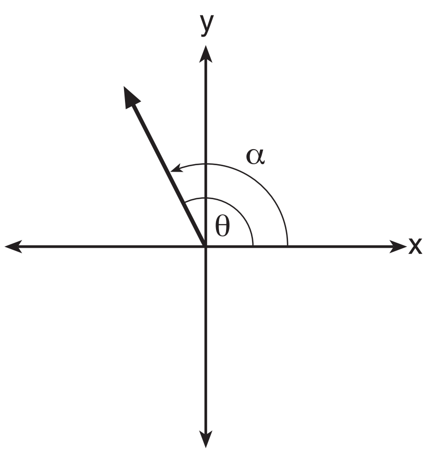
5 As x increases from 0 to $\frac{\pi}{2}$, the graph of the equation $y = 2 \tan x$ will

(1) increase from 0 to 2
(2) decrease from 0 to -2
(3) increase without limit
(4) decrease without limit

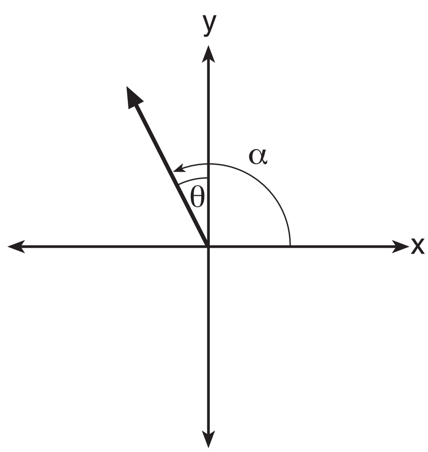
6 Which equation represents a parabola with the focus at $(0, -1)$ and the directrix $y = 1$?

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

7 Which diagram represents an angle, α, measuring $\frac{13\pi}{20}$ radians drawn in standard position, and its reference angle, θ?



(1)



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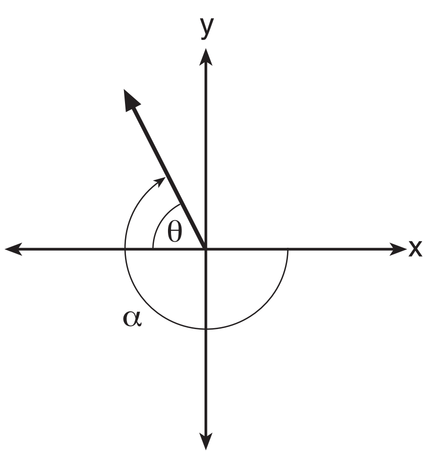

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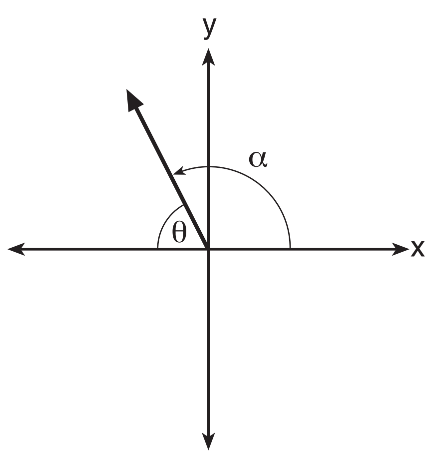


(4)

Use this space for computations.

8 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 $-i$

9 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

10 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) $A = 100(0.116381)^t$

11 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

Use this space for computations.

12 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 (3) B and C

(2) A and D (4) B and D

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

(1) $2x^2 + x + 5$ (3) $2x^2 - x + 5$

(2) $2x^2 + \frac{11}{2} + \frac{1}{2(2x - 1)}$ (4) $2x^2 - x + 4 + \frac{1}{2x - 1}$

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

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

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

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

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

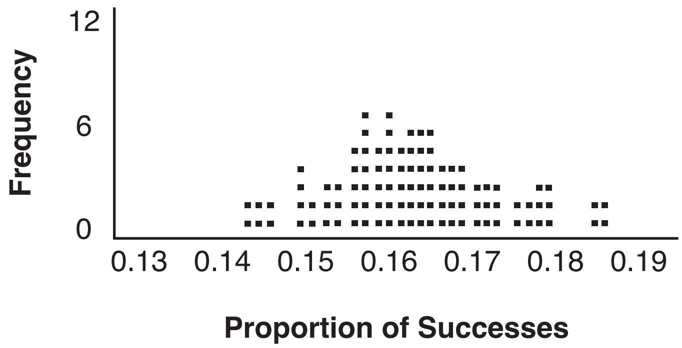
(2) $x^4 + 4x^2 + 9x^2y^2 - 36y^2 = (x + 3y)^2 (x - 2)^2$

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

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

Use this space for computations.

16 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 ≈ .16; margin of error ≈ .01

(2) proportion ≈ .16; margin of error ≈ .02

(3) proportion ≈ .01; margin of error ≈ .16

(4) proportion ≈ .02; margin of error ≈ .16

17 Which scenario is best described as an observational study?

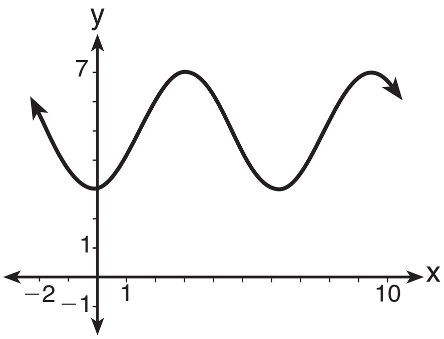
(1) For a class project, students in Health class ask every tenth student entering the school if they eat breakfast in the morning.

(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.

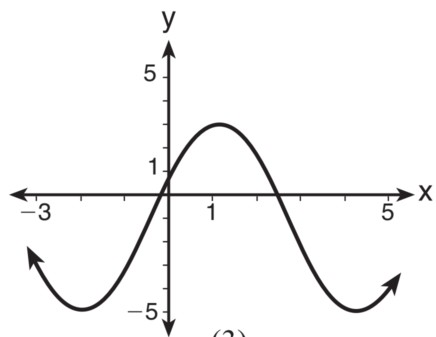
(3) A researcher wants to learn whether or not there is a link between children's daily amount of physical activity and their overall energy level. During lunch at the local high school, she distributed a short questionnaire to students in the cafeteria.

(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.

18 Which sinusoid has the greatest amplitude?



(1)



(3)

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

(2)

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

(4)

19 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

20 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) $x - 7$

21 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

Use this space for computations.

22 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.

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

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

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

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

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

24 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) $a_0 = 1000$
$a_n = a_{n-1}(1.018) + 750n$

Part II

Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

25 Explain how $(-8)^{\frac{4}{3}}$ can be evaluated using properties of rational exponents to result in an integer answer.

26 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?

27 Verify the following Pythagorean identity for all values of x and y:

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

28 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.

29 While experimenting with her calculator, Candy creates the sequence 4, 9, 19, 39, 79, … .

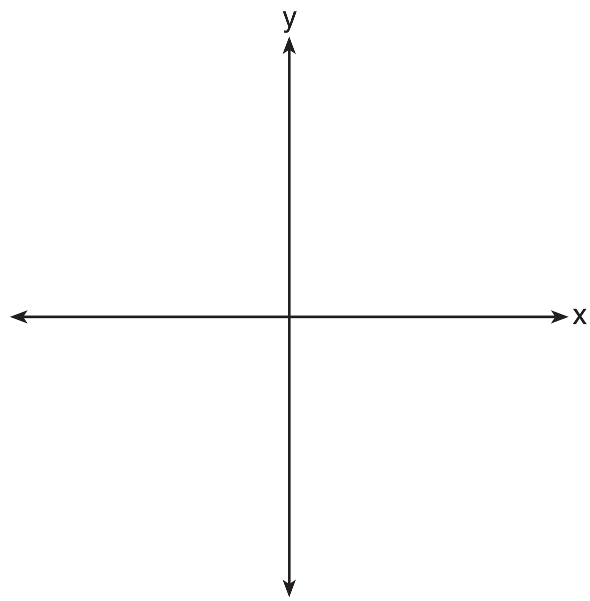
Write a recursive formula for Candy's sequence.

Determine the eighth term in Candy's sequence.

30 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*.

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

32 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.



Part III

Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

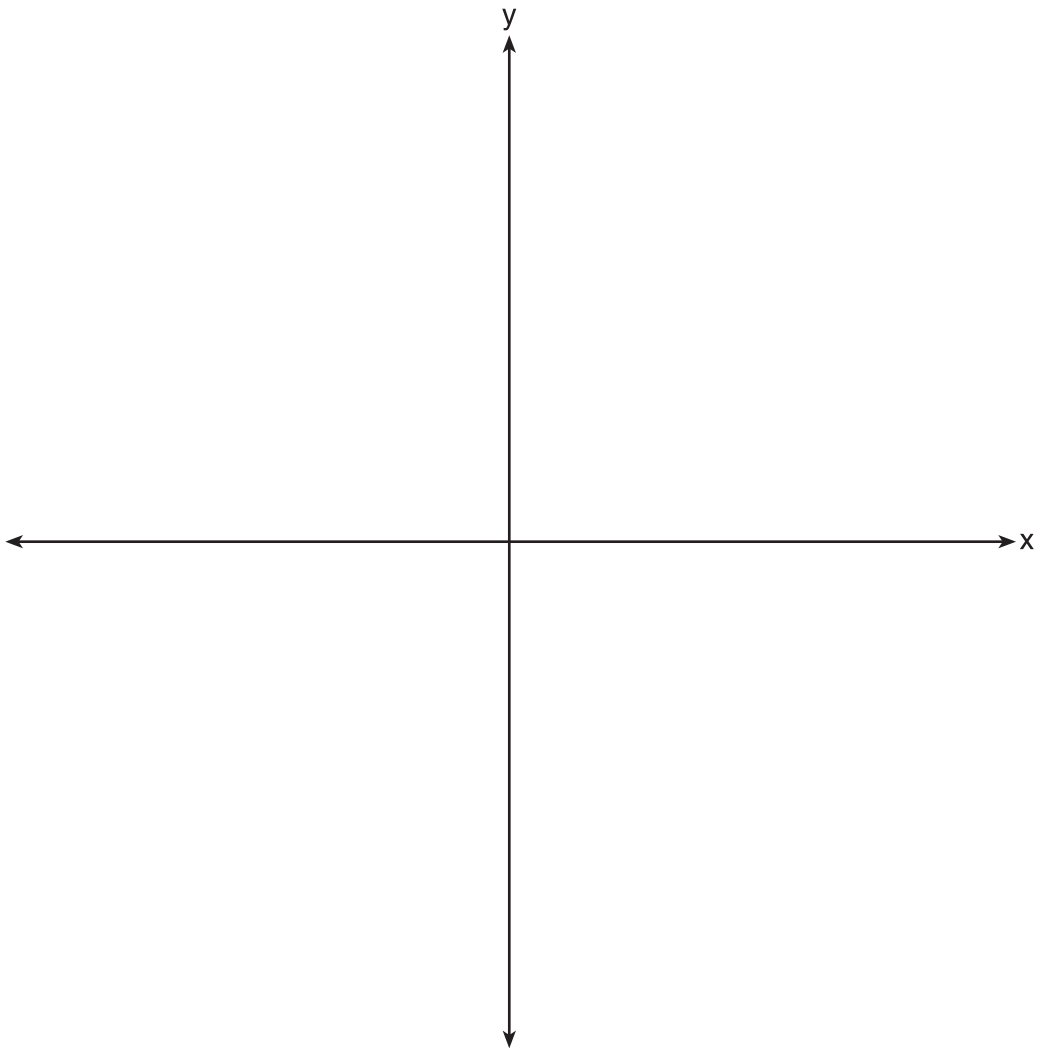
33 Solve for all values of p: $\frac{3p}{p-5} - \frac{2}{p+3} = \frac{p}{p+3}$

34 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 nth 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.

35 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 2π.



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*.

36 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*.

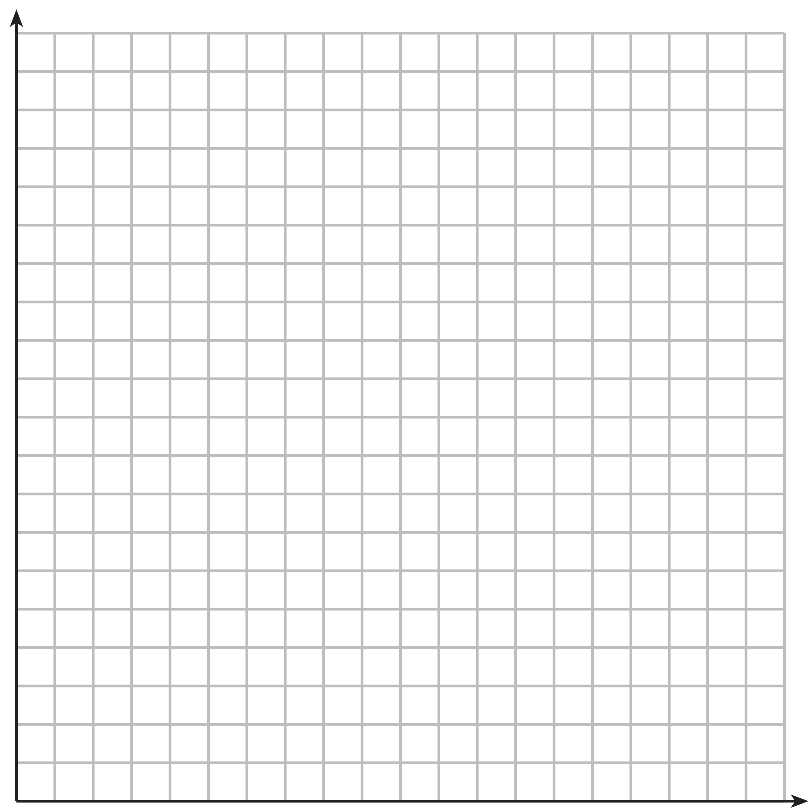
The researcher knows that people are likely to suffer from food-borne illness if the number of spores exceeds 100. Using the exponential regression equation, determine the maximum amount of time, to the *nearest quarter hour*, that the meat can be kept at room temperature safely.

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [6]

37 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.

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Scrap Graph Paper — This sheet will *not* be scored.

Tear Here

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High School Math Reference Sheet

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
1 mile = 5280 feet	1 pound = 0.454 kilogram	1 quart = 2 pints
1 mile = 1760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
1 mile = 1.609 kilometers	1 ton = 2000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallon
		1 liter = 1000 cubic centimeters

Triangle	$A = \frac{1}{2}bh$
Parallelogram	$A = bh$
Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$
Cone	$V = \frac{1}{3}\pi r^2 h$
Pyramid	$V = \frac{1}{3}Bh$

Pythagorean Theorem	$a^2 + b^2 = c^2$
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Arithmetic Sequence	$a_n = a_1 + (n - 1)d$
Geometric Sequence	$a_n = a_1 r^{n-1}$
Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Radians	1 radian $= \frac{180}{\pi}$ degrees
Degrees	1 degree $= \frac{\pi}{180}$ radians
Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$

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ALGEBRA II

FOR TEACHERS ONLY

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

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Wednesday, August 16, 2017 — 12:30 to 3:30 p.m., only

SCORING KEY AND RATING GUIDE

Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Regents Examination in Algebra II. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examination in Algebra II*.

Do *not* attempt to correct the student's work by making insertions or changes of any kind. In scoring the constructed-response questions, use check marks to indicate student errors. Unless otherwise specified, mathematically correct variations in the answers will be allowed. Units need not be given when the wording of the questions allows such omissions.

Each student's answer paper is to be scored by a minimum of three mathematics teachers. No one teacher is to score more than approximately one-third of the constructed-response questions on a student's paper. Teachers may not score their own students' answer papers. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Raters should record the student's scores for all questions and the total raw score on the student's separate answer sheet. Then the student's total raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ by Wednesday, August 16, 2017. Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score. The student's scale score should be entered in the box provided on the student's separate answer sheet. The scale score is the student's final examination score.

If the student's responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.

Part I

Allow a total of 48 credits, 2 credits for each of the following.

(1) 1	(9) 3	(17) . . . . . 2 . . . . .
(2) 3	(10) 3	(18) . . . . . 4 . . . . .
(3) 3	(11) 1	(19) . . . . . 1 . . . . .
(4) 2	(12) 4	(20) . . . . . 2 . . . . .
(5) 3	(13) 1	(21) . . . . . 4 . . . . .
(6) 2	(14) 2	(22) . . . . . 1 . . . . .
(7) 4	(15) 1	(23) . . . . . 4 . . . . .
(8) 4	(16) 2	(24) . . . . . 3 . . . . .

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site at: http://www.p12.nysed.gov/assessment/ and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

The Department is providing supplemental scoring guidance, the "Model Response Set," for the Regents Examination in Algebra II. This guidance is recommended to be part of the scorer training. Schools are encouraged to incorporate the Model Response Sets into the scorer training or to use them as additional information during scoring. While not reflective of all scenarios, the model responses selected for the Model Response Set illustrate how less common student responses to constructed-response questions may be scored. The Model Response Set will be available on the Department's web site at http://www.nysedregents.org/algebratwo/.

General Rules for Applying Mathematics Rubrics

I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examination in Algebra II are designed to provide a systematic, consistent method for awarding credit. The rubrics are not to be considered all-inclusive; it is impossible to anticipate all the different methods that students might use to solve a given problem. Each response must be rated carefully using the teacher's professional judgment and knowledge of mathematics; all calculations must be checked. The specific rubrics for each question must be applied consistently to all responses. In cases that are not specifically addressed in the rubrics, raters must follow the general rating guidelines in the publication *Information Booklet for Scoring the Regents Examination in Algebra II*, use their own professional judgment, confer with other mathematics teachers, and/or contact the State Education Department for guidance. During each Regents Examination administration period, rating questions may be referred directly to the Education Department. The contact numbers are sent to all schools before each administration period.

II. Full-Credit Responses

A full-credit response provides a complete and correct answer to all parts of the question. Sufficient work is shown to enable the rater to determine how the student arrived at the correct answer.

When the rubric for the full-credit response includes one or more examples of an acceptable method for solving the question (usually introduced by the phrase "such as"), it does not mean that there are no additional acceptable methods of arriving at the correct answer. Unless otherwise specified, mathematically correct alternative solutions should be awarded credit. The only exceptions are those questions that specify the type of solution that must be used; e.g., an algebraic solution or a graphic solution. A correct solution using a method other than the one specified is awarded half the credit of a correct solution using the specified method.

III. Appropriate Work

Full-Credit Responses: The directions in the examination booklet for all the constructed-response questions state: "Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc." The student has the responsibility of providing the correct answer ***and*** showing how that answer was obtained. The student must "construct" the response; the teacher should not have to search through a group of seemingly random calculations scribbled on the student paper to ascertain what method the student may have used.

Responses With Errors: Rubrics that state "Appropriate work is shown, but…" are intended to be used with solutions that show an essentially complete response to the question but contain certain types of errors, whether computational, rounding, graphing, or conceptual. If the response is incomplete; i.e., an equation is written but not solved or an equation is solved but not all of the parts of the question are answered, appropriate work has ***not*** been shown. Other rubrics address incomplete responses.

IV. Multiple Errors

Computational Errors, Graphing Errors, and Rounding Errors: Each of these types of errors results in a 1-credit deduction. Any combination of two of these types of errors results in a 2-credit deduction. No more than 2 credits should be deducted for such mechanical errors in a 4-credit question and no more than 3 credits should be deducted in a 6-credit question. The teacher must carefully review the student's work to determine what errors were made and what type of errors they were.

Conceptual Errors: A conceptual error involves a more serious lack of knowledge or procedure. Examples of conceptual errors include using the incorrect formula for the area of a figure, choosing the incorrect trigonometric function, or multiplying the exponents instead of adding them when multiplying terms with exponents.

If a response shows repeated occurrences of the same conceptual error, the student should not be penalized twice. If the same conceptual error is repeated in responses to other questions, credit should be deducted in each response.

For 4- and 6-credit questions, if a response shows one conceptual error and one computational, graphing, or rounding error, the teacher must award credit that takes into account both errors. Refer to the rubric for specific scoring guidelines.

Part II

For each question, use the specific criteria to award a maximum of 2 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(25) **[2]** A correct explanation is written.

[1] Appropriate work is shown, but one computational or simplification error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] Appropriate work is shown, but an incomplete or incorrect explanation is written.

or

[1] 16, but no further correct work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(26) **[2]** 0.8 or an equivalent value, and correct work is shown.

[1] Appropriate work is shown, but one computational or rounding error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] 0.8, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(27) **[2]** A correct verification is written.

[1] Appropriate work is shown, but one simplification error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(28) **[2]** A correct explanation is written, such as assigning a flavor to a number and observing the number of times 4 of the same flavor occurred consecutively.

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] Appropriate work is shown, but the explanation is incomplete.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(29) **[2]** A correct recursive formula, such as $\begin{array}{l} a_1 = 4 \\ a_n = 2a_{n-1} + 1, \end{array}$ 639, and correct work is shown.

[1] Appropriate work is shown, but one computational error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] $\begin{array}{l} a_1 = 4 \\ a_n = 2a_{n-1} + 1, \end{array}$ is written, but no further correct work is shown.

or

[1] Appropriate work is shown to find 639, but no further correct work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(30) **[2]** 4, and correct algebraic work is shown.

[1] Appropriate work is shown, but one computational, simplification, or rounding error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] 4, but a method other than algebraic is used.

or

[1] 4, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(31) **[2]** Even, and correct algebraic work is shown.

[1] Appropriate work is shown, but one computational error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] Even, but a method other than algebraic is used.

[0] Even, but no work is shown.

or

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(32) **[2]** A positive cubic function is sketched and labeled with its roots at $-c$, b, then a, and a y-intercept at d.

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] An appropriate function is sketched, but one label or intercept is incorrect or is missing.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Part III

For each question, use the specific criteria to award a maximum of 4 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(33) **[4]** $-5, -1$ and correct work is shown.

[3] Appropriate work is shown, but one computational, factoring, or graphing error is made.

or

[3] Appropriate work is shown, but only one correct value is found.

[2] Appropriate work is shown, but two or more computational, factoring, or graphing errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] A quadratic equation in standard form is written, but no further correct work is shown.

or

[2] -5 and -1, but no work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational, factoring, or graphing error are made.

or

[1] An equation cleared of fractions is written, but no further correct work is shown.

or

[1] -5 or -1, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(34) **[4]** $a_n = 1.25 + 0.25(n - 1)$ or an equivalent equation, and 16, and correct work is shown.

[3] Appropriate work is shown, but one computational or substitution error is made.

[2] Appropriate work is shown, but two or more computational or substitution errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] Appropriate work is shown to find $a_n = 1.25 + 0.25(n - 1)$, but no further correct work is shown.

or

[2] Appropriate work is shown to find 16, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or substitution error are made.

or

[1] Appropriate work is shown to find the expression $1.25 + 0.25(n - 1)$, but no further correct work is shown.

or

[1] $a_n = 1.25 + 0.25(n - 1)$ or 16, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(35) **[4]** A correct sketch with at least one cycle is drawn and a correct explanation is written.

[3] Appropriate work is shown, but one graphing or labeling error is made.

or

[3] A correct sketch is drawn, but the explanation is incorrect or missing.

[2] Appropriate work is shown, but two or more graphing errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

[1] Appropriate work is shown, but one conceptual error and one graphing or labeling error are made.

or

[1] A correct explanation is written, but no further correct work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(36) **[4]** $y = 4.168(3.981)^x$ and 2 hours 15 minutes or an equivalent time, and correct work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] $y = 4.168(3.981)^x$ or 2 hours 15 minutes and correct work, but no further correct work is shown.

or

[2] An incorrect regression equation of equal difficulty is solved appropriately for the amount of time.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or

[1] The expression $4.168(3.981)^x$ is written, but no further correct work is shown.

or

[1] 2 hours 15 minutes, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Part IV

For each question, use the specific criteria to award a maximum of 6 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(37) **[6]** Correct graphs are drawn and at least one is labeled, 1.95 and a correct explanation, and 6 and a correct justification is given.

[5] Appropriate work is shown, but one computational, graphing, labeling, or rounding error is made.

[4] Appropriate work is shown, but two computational, graphing, labeling, or rounding errors are made.

or

[4] Appropriate work is shown, but one conceptual error is made.

[3] Appropriate work is shown, but three or more computational, graphing, labeling, or rounding errors are made.

or

[3] Appropriate work is shown, but one conceptual error and one computational, graphing, labeling, or rounding error are made.

[2] Appropriate work is shown, but two conceptual errors are made.

or

[2] Both graphs are drawn correctly and at least one is labeled, but no further correct work is shown.

or

[2] 1.95 and a correct explanation is written, but no further correct work is shown.

or

[2] Appropriate work is shown to find 6, but no further correct work is shown.

or

[2] 1.95 and 6, but no work is shown.

[1] Appropriate work is shown, but two conceptual errors and one computational, graphing, labeling or rounding error are made.

or

[1] 1.95 or 6, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Map to the Learning Standards
Algebra II
August 2017

Question	Type	Credits	Cluster
1	Multiple Choice	2	A-SSE.A
2	Multiple Choice	2	N-CN.A
3	Multiple Choice	2	N-CN.C
4	Multiple Choice	2	A-REI.A
5	Multiple Choice	2	F-IF.C
6	Multiple Choice	2	G-GPE.A
7	Multiple Choice	2	F-TF.A
8	Multiple Choice	2	A-APR.B
9	Multiple Choice	2	F-IF.B
10	Multiple Choice	2	A-SSE.B
11	Multiple Choice	2	S-ID.A
12	Multiple Choice	2	F-IF.B
13	Multiple Choice	2	A-APR.D
14	Multiple Choice	2	F-BF.B
15	Multiple Choice	2	A-SSE.A
16	Multiple Choice	2	S-IC.B
17	Multiple Choice	2	S-IC.B
18	Multiple Choice	2	F-IF.C
19	Multiple Choice	2	A-REI.C
20	Multiple Choice	2	A-APR.B

21	Multiple Choice	2	A-SSE.B
22	Multiple Choice	2	S-IC.B
23	Multiple Choice	2	N-RN.A
24	Multiple Choice	2	F-BF.A
25	Constructed Response	2	N-RN.A
26	Constructed Response	2	S-CP.A
27	Constructed Response	2	A-APR.C
28	Constructed Response	2	S-IC.A
29	Constructed Response	2	F-BF.A
30	Constructed Response	2	F-LE.A
31	Constructed Response	2	F-BF.B
32	Constructed Response	2	A-APR.B
33	Constructed Response	4	A-REI.A
34	Constructed Response	4	F-BF.A
35	Constructed Response	4	F-IF.C
36	Constructed Response	4	S-ID.B
37	Constructed Response	6	A-REI.D

Regents Examination in Algebra II

August 2017

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score for the August 2017 Regents Examination in Algebra II* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ by Wednesday, August 16, 2017. Conversion charts provided for previous administrations of the Regents Examination in Algebra II must NOT be used to determine students' final scores for this administration.

Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm.

2. Select the test title.

3. Complete the required demographic fields.

4. Complete each evaluation question and provide comments in the space provided.

5. Click the SUBMIT button at the bottom of the page to submit the completed form.

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II

Wednesday, August 16, 2017 — 12:30 to 3:30 p.m.

MODEL RESPONSE SET

Table of Contents

Question 25

25 Explain how $(-8)^{\frac{4}{3}}$ can be evaluated using properties of rational exponents to result in an integer answer.

rewrite $\frac{4}{3}$ as $\frac{1}{3} \times \frac{4}{1}$, using the power to a power rule

Score 2: The student gave a complete and correct response.

Question 25

25 Explain how $(-8)^{\frac{4}{3}}$ can be evaluated using properties of rational exponents to result in an integer answer.

-8 can be cube rooted, followed by being raised to the 4th power, making the answer 16.

Score 2: The student gave a complete and correct response.

Question 25

25 Explain how $(-8)^{\frac{4}{3}}$ can be evaluated using properties of rational exponents to result in an integer answer.

$$(-8)^{\frac{4}{3}} = \left(\sqrt[3]{-8}\right)^4 = (-2)^4 = 16$$

Score 1: The student gave a correct justification, not an explanation.

Question 25

25 Explain how $(-8)^{\frac{4}{3}}$ $\frac{\text{power}}{\text{root}}$ can be evaluated using properties of rational exponents to result in an integer answer.

$\sqrt[3]{(-8)^4}$

set up $(-8)^{\frac{4}{3}}$ as $\frac{\text{power}}{\text{root}}$, $\sqrt[3]{(-8)^4}$

$(-8)^4 = -4096$?

$\sqrt[3]{-4096} = 16i$

Score 0: The student made multiple errors and did not provide an explanation.

26 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?

$P(W \text{ and } D) = .4$

$P(D) = .5$

$$\frac{.4}{.5} = \underbrace{\boxed{.8}}^{P(W|D)}$$

Score 2: The student gave a complete and correct response.

Question 26

26 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?

50% - drug

50% - sugar pill

recieving drug + getting well = 40%

$$\frac{40}{50} = .8 = 80\%$$

Score 2: The student gave a complete and correct response.

Question 26

26 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?

	Drug	Sugar	
Well	.4	.4	.8
Not Well	.1	.1	.2
	.50	.50	1

$\frac{.4}{.50}$

$\boxed{.8}$

Score 1: The student gave a correct answer based on the drug column in the table, even though there is no evidence to support the data in the sugar column.

Question 26

26 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?

$$P(W) \cdot P(D)$$
$$(.4)(.5)$$
$$\boxed{.20}$$

Score 0: The student made an error confusing independence with conditional probability, and substituted incorrectly for $P(W)$, which is actually unknown.

Question 27

27 Verify the following Pythagorean identity for all values of x and y:

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

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

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

$(x^2+y^2)^2 = x^4+2x^2y^2+y^4$

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

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

Score 2: The student gave a complete and correct response.

Question 27

27 Verify the following Pythagorean identity for all values of x and y:

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

$$\begin{array}{c|c|c} & x^2 & y^2 \\ \hline x^2 & x^4 & x^2y^2 \\ \hline y^2 & x^2y^2 & y^4 \end{array}$$

$$X^4 + 2X^2Y^2 + Y^4 = X^4 - 2X^2Y^2 + Y^4 + 4X^2Y^2$$

$$X^4 + 2X^2Y^2 + Y^4 = X^4 + 2X^2Y^2 + Y^4 \quad \checkmark$$

Score 2: The student gave a complete and correct response.

Question 27

27 Verify the following Pythagorean identity for all values of x and y:

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

$$\cancel{x^4} + 2x^2y^2 + \cancel{y^4} = \cancel{x^4} - \cancel{2x^2y^2} + y^4 + 4x^2y^2$$
$$-x^4 \quad +2x^2y^2 \quad -y^4 \qquad -x^4 \quad +2x^2y^2 \quad -y^4$$
$$4x^2y^2 = 4x^2y^2 \checkmark$$

Score 2: The student gave a complete and correct response given there are no domain restrictions for addition and subtraction.

Question 27

27 Verify the following Pythagorean identity for all values of x and y:

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

$$\cancel{x^4} + 2x^2y^2 + \cancel{y^4} = \cancel{x^4} - \cancel{2x^2y^2} + \cancel{y^4} + 2x^2y^2$$

$$-\cancel{x^4} + 2x^2y^2 - \cancel{y^4} \quad - \cancel{x^4} + \cancel{2x^2y^2} - \cancel{y^4}$$

$$4x^2y^2 \neq 2x^2y^2$$

Score 1: The student made an error squaring $2xy$.

Question 27

27 Verify the following Pythagorean identity for all values of x and y:

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

IF $X = 2$
IF $y = 4$

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

$(4 + 16)^2 = (4 - 16)^2 + (16)^2$

$400 = 144 + 256$

$400 \stackrel{\checkmark}{=} 400$

Score 0: The student did not verify the identity for all values of x and y.

Question 28

28 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.

The student could choose a number to represent black jellybeans, then see how many times that number would have been rolled 4 times in a row after 250 simulations of rolling a die.

Score 2: The student gave a complete and correct response.

28 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.

On a die, there are six numbers (1-6). If her student rolled the die 250 times, the student could calculate the probability of getting each of the numbers. If the student identified each flavor of jelly bean with a number (ex. black is six), the student could see how likely the chance would be of getting black/six.

Score 1: The student gave an incomplete explanation.

Question 28

28 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.

This simulation would work because the dice
takes the place of the 6 different flavors of
jelly beans and the numbers on the dice
represent each of the 6 flavors. Each 4 times the
dice is rolled, the numbers would represent the
the 4 jelly beans that were picked out of the
bag.

Score 1: The student gave an incomplete explanation.

Question 28

28 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.

Rolling the dice 250 times is testing probability because the chances of rolling a dice 250 times and getting the same number more than 4 times might be high or low but you would be able to test that theory out of 250 times.

Score 0: The student did not explain the simulation.

Question 29

29 While experimenting with her calculator, Candy creates the sequence 4, 9, 19, 39, 79, … .

5 10 20 40

Write a recursive formula for Candy's sequence.

$9 = 2 \cdot 4 + 1$

$19 = 2 \cdot 9 + 1$

$39 = 2 \cdot 18 + 1$

$a_1 = 4$

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

Determine the eighth term in Candy's sequence.

$a_6 = 2(79) + 1 = 159$

$a_7 = 2(159) + 1 = 319$

$a_8 = 2(319) + 1 = 639$

Score 2: The student gave a complete and correct response.

Question 29

29 While experimenting with her calculator, Candy creates the sequence 4, 9, 19, 39, 79, … .

Write a recursive formula for Candy's sequence.

$2X+1$

Determine the eighth term in Candy's sequence.

6 $2(79)+1=159$

7 $2(159)+1=319$

8 $2(319)+1=639$

Score 1: The student showed appropriate work to find 639.

Question 29

29 While experimenting with her calculator, Candy creates the sequence 4, 9, 19, 39, 79, … .

Write a recursive formula for Candy's sequence.

$$a_n = (a_{n-1} \cdot 2) + 1$$

Determine the eighth term in Candy's sequence.

+5 +10 +20 +40 +80 +160 +320

4, 9, 19, 39, 79, 159, 319, 639

a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8

$$\boxed{a_8 = 639}$$

Score 1: The student did not identify $a_1 = 4$.

Question 29

29 While experimenting with her calculator, Candy creates the sequence 4, 9, 19, 39, 79, … .

Write a recursive formula for Candy's sequence.

$a_1 = 4$

$a_n = 5(2^{n-1}) - 1$

Determine the eighth term in Candy's sequence.

639

Score 1: The student did not write a recursive formula.

Question 29

29 While experimenting with her calculator, Candy creates the sequence 4, 9, 19, 39, 79, … .

Write a recursive formula for Candy's sequence.

$\frac{9}{4} = 2.25$

$n(2.25)^x$

Determine the eighth term in Candy's sequence.

$a_8 = (4)(2.25)^7$ $\cancel{a_n = a_1 + (n-1)d}$

$a_8 = 1167.717041$

Score 0: The student provided no correct work.

Question 29

29 While experimenting with her calculator, Candy creates the sequence 4, 9, 19, 39, 79, … .

Write a recursive formula for Candy's sequence.

$n = 2n + 1$

Determine the eighth term in Candy's sequence.

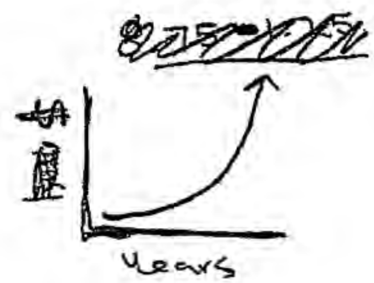
4, 9, 19, 39, 79, 159, 317, 633

$\boxed{633}$

Score 0: The student did not provide a recursive formula and made a computational error.

Question 30

30 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.*



$$8.75 = 1.25(x)^{2015-1966}$$

$$8.75 = 1.25(x)^{49}$$

$$\sqrt[49]{7} = \sqrt[49]{x^{49}}$$

$$1.0405 \approx \boxed{4\% \text{ growth}}$$

Score 2: The student gave a complete and correct response.

Question 30

30 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.*

$$8.75 = 1.25(x)^{49}$$

$$7 = x^{49}$$

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

$$\boxed{x = 1.04}$$

Score 1: The student did not determine the rate of growth.

Question 30

30 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.*

$$A = e^{rx}$$

$$7.5 = e^{r \cdot 49}$$

$$\frac{\ln 7.5}{49} = \frac{r \cdot 49}{49}$$

$$r = .0411\ldots$$

$$\boxed{r = 4\%}$$

Score 1: The student made an error by subtracting $8.75 - 1.25$.

Question 30

30 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.*

$$A = 1.25_0 e^{K(2015-1966_0)} + 8.75_0$$

$$K(49)$$

$$-8.75 = 3.397\ldots$$

$$\ln -8.75 = -49K \ln 3.397\ldots$$

$$1.7733 = 49K$$

$$.036 = K$$

$$\boxed{4\%}$$

Score 0: The student obtained a correct answer, but made multiple errors.

Question 31

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

$j(x) = x^4 - 3x^2 - 4$

$j(-x) = (-x)^4 - 3(-x)^2 - 4$

$j(-x) = x^4 - 3x^2 - 4$

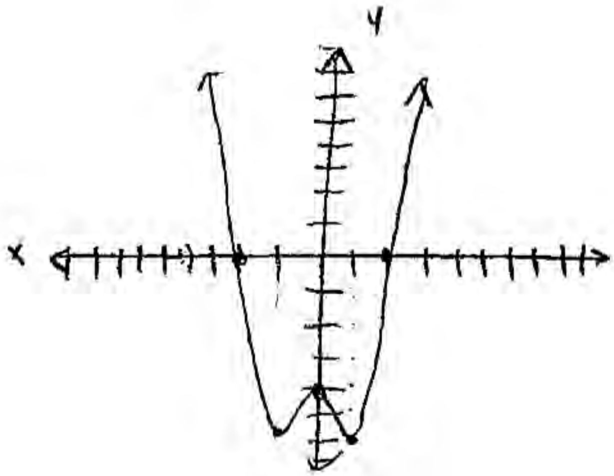
$\boxed{j(-x) = j(x)}$

Even function as $j(-x)$ is the same as $j(x)$

Score 2: The student gave a complete and correct response.

Question 31

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



j(x) is even
b/c it is symmetric
across the
y axis

Score 1: The student used a method other than algebraic.

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

$j(-1) = -6$

$j(1) = -6$

$j(x)$ is even

Score 1: The student did not verify for all values of $-x$.

Question 31

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

even because all exponents are even.

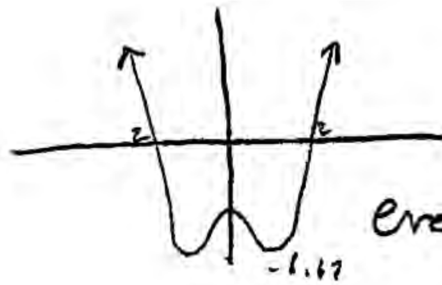
Score 1: The student used a method other than algebraic.

Question 31

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

$x^4 - 3x^2 - 4$

$\cancel{x^2(x^2} - 3$



even

even has two arrows going same way up

it's not add

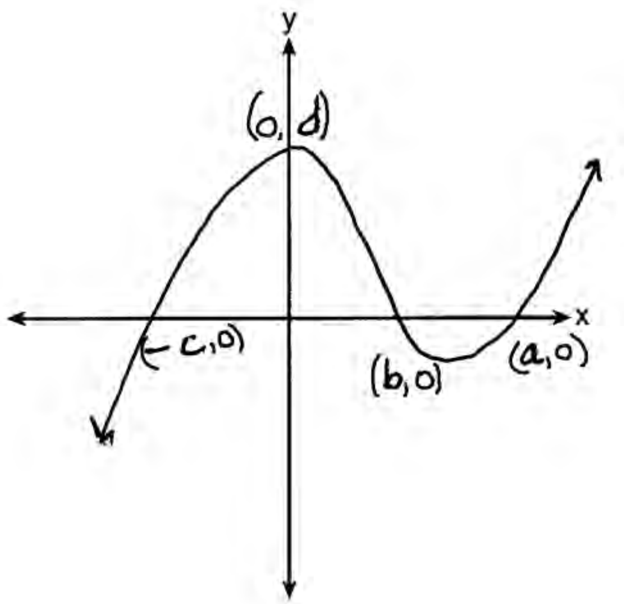
because

it will have

Score 0: The student incorrectly justified an even function and used a method other than algebraic.

Question 32

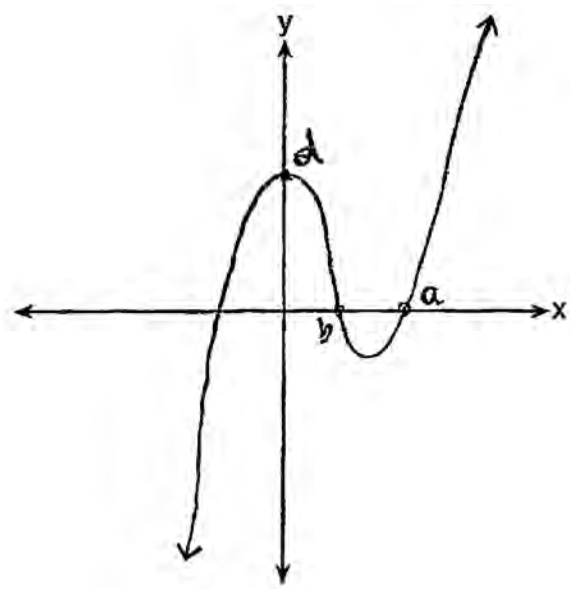
32 On the axes below, sketch a possible function $p(x) = (x - a)(x - b)(x + c)$, where a, b, and c are positive, $a > b$, and $p(x)$ has a positive y-intercept of d. Label all intercepts.



Score 2: The student gave a complete and correct response.

Question 32

32 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.



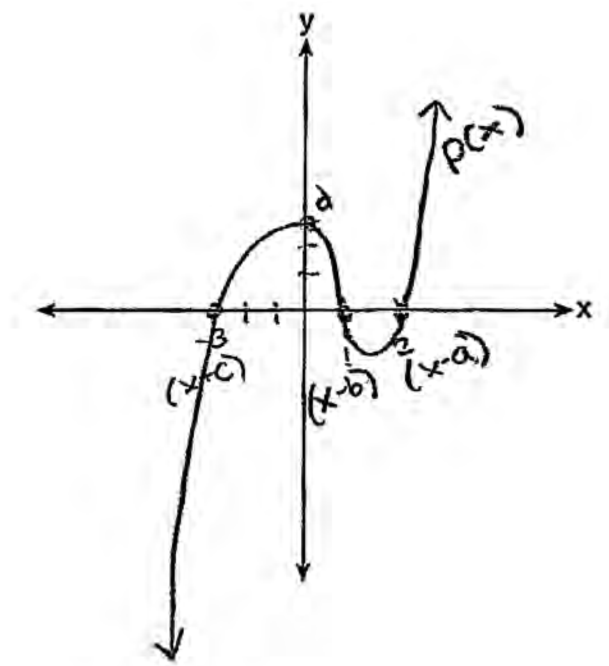
Score 1: The student did not label the intercept at $-c$.

Question 32

$x=2$ $x=1$

$x=a$ $x=b$ $x=-c$ $x=-3$

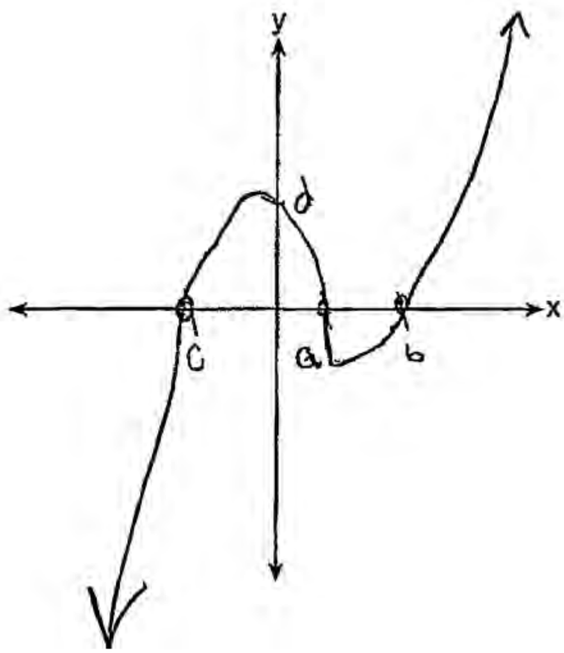
32 On the axes below, sketch a possible function $p(x) = (x - a)(x - b)(x + c)$, where a, b, and c are positive, $a > b$, and $p(x)$ has a positive y-intercept of d. Label all intercepts.



Score 1: The student did not label the x-intercepts correctly.

Question 32

32 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.



Score 0: The student made multiple labeling errors.

Question 33

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

p+3 p-5

p+3 p-5 p-5 p-5

$$\frac{3p^2+9p}{(p+3)(p-5)} - \frac{2p-10}{(p+3)(p-5)} = \frac{p^2-5p}{(p+3)(p-5)}$$

$$\frac{3p^2+7p+10}{(p+3)(p-5)} = \frac{p^2-5p}{(p+3)(p-5)}$$

$$3p^2+7p+10 = p^2-5p$$
$$-p^2+5p \qquad -p^2+5p$$

$$2p^2+12p+10=0$$
$$10p+2p$$
$$(2p+2)(p+5)=0$$

$$2p+2=0 \qquad p+5=0$$
$$-2\ -2 \qquad -5\ -5$$
$$\frac{2p}{2}=\frac{-2}{2} \qquad \boxed{p=-5}$$
$$\boxed{p=-1}$$

Check

$$\frac{3p}{p-5} - \frac{2}{p+3} = \frac{p}{p+3}$$
$$\frac{3(-1)}{-1-5} - \frac{2}{-1+3} = \frac{-1}{-1+3}$$
$$-\frac{3}{-6} - \frac{2}{2} = -\frac{1}{2}$$
$$\frac{3}{6} - \frac{6}{6} = \frac{-1}{-2}$$
$$-\frac{3}{6} = -\frac{1}{2}$$
$$-\frac{1}{2} = -\frac{1}{2}$$

Check

$$\frac{3p}{p-5} - \frac{2}{p+3} = \frac{p}{p+3}$$
$$\frac{3(-5)}{-5-5} - \frac{2}{-5+3} = \frac{-5}{-5+3}$$
$$\frac{-15}{-10} - \frac{2}{-2} = \frac{-5}{-2}$$
$$\frac{-15}{-10} + 1 = \frac{5}{2}$$
$$\frac{3}{2} + \frac{2}{2} = \frac{5}{2}$$
$$\frac{5}{2} = \frac{5}{2}$$

Score 4: The student gave a complete and correct response.

Question 33

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

$3p(p+3) + -2(p-5) = p(p-5)$

$3p^2 + 7p + 10 = p^2 - 5p$

$-(p^2 - 5p) = -(p^2 - 5p)$

$2p^2 + 12p + 10 = 0$

$2(p+1)(p+5) = 0$

$p+1=0$ or $p+5=0$

-1 $\quad$ $\cancel{-5}$ Reject

Score 3: The student incorrectly rejected one of the solutions.

Question 33

$(p-5)(p+3)$

33 Solve for all values of p: $\left(\frac{3p}{p-5} - \frac{2}{p+3}\right) = \left(\frac{p}{p+3}\right)(p-5)(p+3)$

$$3p(p+3)+2(p-5) = p(p-5)$$
$$3p^2+9p+2p-10 = p^2-5p$$
$$-p^2+5p \qquad -p^2+5p$$
$$2p^2+16p-10=0$$
$$\frac{2(p^2+8p-5)}{2}=\frac{0}{2}$$
$$p^2+8p-5=0$$
$$a=1 \quad b=8 \quad c=-5$$
$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$
$$x=\frac{-8\pm\sqrt{8^2-4(1)(-5)}}{2(1)}$$
$$=\frac{-8\pm\sqrt{64+20}}{2}$$
$$=\frac{-8\pm\sqrt{84}}{2}$$
$$=\frac{-8\pm2\sqrt{21}}{2}$$
$$=\frac{\cancel{2}(-4\pm\sqrt{21})}{\cancel{2}}$$
$$=-4\pm\sqrt{21}$$

$\{-4+\sqrt{21}, -4-\sqrt{21}\}$

Score 2: The student made a transcription error in the first line of the solution and did not check for extraneous solutions.

Question 33

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

$$\frac{3p}{p-5} = \frac{p}{p+3} + \frac{2}{p+3}$$

$$\cancel{\frac{3p}{p-5} = \frac{2+p}{p+3} \cdot \frac{p+3}{2+p}}$$

$$\cancel{\frac{p+3}{2+p} \quad \frac{3p}{p-5}}$$

$$\frac{3p}{p-5} = \frac{2+p}{p+3}$$

$$3p(p+3) = (2+p)(p-5)$$

$$3p^2 + 9p = 2p + p^2 - 10 - 5p$$

$$2p^2 + 12p = -10$$

$$2p^2 + 12p + 10 = 0$$

$$\cancel{(p^2+10)(p^2+2)}$$

Score 2: The student wrote a correct quadratic equation in standard form.

Question 33

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

$+\frac{2}{p+3}$ $+\frac{2}{p+3}$

$\frac{3p}{p-5} = \frac{p}{p+3} + \frac{2}{p+3}$

$\frac{3p}{p-5} = \frac{2+p}{p+3}$

$3p^2 + 9p = p^2 - 3p - 10$

$-p^2 \quad -p^2$

$2p^2 + 9p = -3p - 10$

$+3p \quad +3p$

$2p^2 + 12p = -10$

$+10 \quad +10$

$2p^2 + 12p + 10$

Score 1: The student wrote a correct quadratic expression.

Question 33

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

$p-5 \quad p$

$p-5 \quad 3$

$p^2-2p-15$

$$\frac{-3p}{p^2-2p+15} - \frac{2}{p^2-2p+15} = \frac{p}{p^2-2p+15}$$

$$3p-2=p$$
$$-3p \qquad -3p$$

$$\frac{-2}{-2}=\frac{-2p}{-2}$$

$$p=1$$

Score 0: The student did not show enough correct work to receive any credit.

Question 34

34 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.

per day, + .25

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 nth term of this sequence.

16 · 5 days 2.25
21 days 6.25
4.00 dif.
card: \$1.

$a_n = a_1 + (n-1)d$

$\boxed{a_n = 1.25 + (n-1).25}$

Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

$\boxed{\$16.00}$ 60 · .25

$a_1 = 1.25 + (60-1).25$

1.25 + 14.75

Score 4: The student gave a complete and correct response.

Question 34

34 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 nth term of this sequence.

$d = \frac{4}{16} \rightarrow .25$

$a_n = a_5 + (n-5)d$

$a_n = 2.25 + (n-5)(.25)$

Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

$a_{60} = 2.25 + (55)(.25)$

$a_{60} = 16$

Score 4: The student gave a complete and correct response.

34 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.

5 days $\Rightarrow$ \$2.25
1 card

21 days $\Rightarrow$ 6.25
1 card

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 nth term of this sequence.

$a_5 = 2.25$

$6.25 = a_1 + d(20)$
$1.25 = a_1 + d(4)$

$4 = 16d \quad d = .25$

$a_{21} = 6.25$

$2.25 = a_1 + 1(4)(.25)$

$a_1 = 1.25$

Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

$\boxed{a_n = 1.25 + .25(n-1)}$

$a_n = .25n + 1$

$a_{60} = 1.25 + .25(60-1)$

$\boxed{\$16}$

Score 4: The student gave a complete and correct response.

34 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 nth term of this sequence.

a= amount due per day late
n= number of days late

$.25n + 1.00$ → Money needed to replace card

Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

$.25 \cdot 60 = 15$

$15 + 1 = 16$

\$16 is needed to pay for overdue book and replace card.

Score 3: The student wrote an expression for a_n.

Question 34

34 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.

$\frac{2.25}{a_5}$ $\frac{6.25}{a_{21}}$ $.25/\text{d}$

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 nth term of this sequence.

$$\boxed{a_n = 2.25 + (n-1).25}$$

Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

$$a_n = 2.25 + (n-1).25$$
$$a_{60} = 2.25 + (59).25$$
$$\boxed{a_{60} = \$17}$$

Score 2: The student made a conceptual error writing the formula for a_n by not adjusting the number of common differences, but found an appropriate amount based on that error.

34 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 nth term of this sequence.

$a_n = a_1 + (n-1)d$

$\boxed{a_n = 2.25 + (n-1)4}$

Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

21 − 5 = 16 day in between
6.25 − 2.25 = 4 between these 16 days
Paid \$.25 each day..
+ #1

$a_n = 2.25 + (60-1)4$

$2.25 + (59)4$

$\boxed{= \$238.25}$

Score 2: The student made a conceptual error writing the formula for a_n by not adjusting the number of common differences, but found an appropriate amount based on that error.

34 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 nth term of this sequence.

5 21

2.25 6.25

4 days = 1 dollar

25¢ = 1 day

Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

5	21	25	29	33	37	41	45	49	53	57	60
2.25	6.25	7.25	8.25	9.25	10.25	11.25	12.25	13.25	14.25	15.25	16.00

\$16.00

Score 1: The student correctly determined \$16 without using a formula.

Question 34

34 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 nth term of this sequence.

$$a_n = \sum_{.25}^{n} (2.25)^{n-1}$$

Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

$\boxed{\$16.00}$

Score 1: The student found the correct amount of money, but did not show any work.

34 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 nth term of this sequence.

$a_n = .45 + (n-1)d$

Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

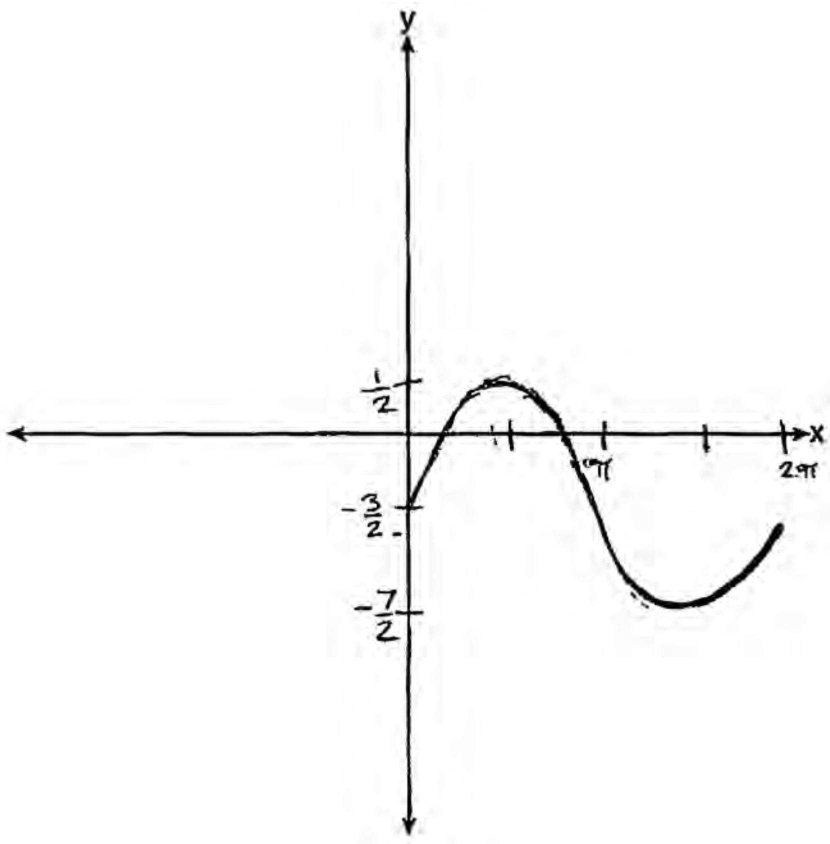
$a_{60} = .45 + (60-1)60$

\$15.93

Score 0: The student did not show any correct work.

Question 35

35 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 2π.



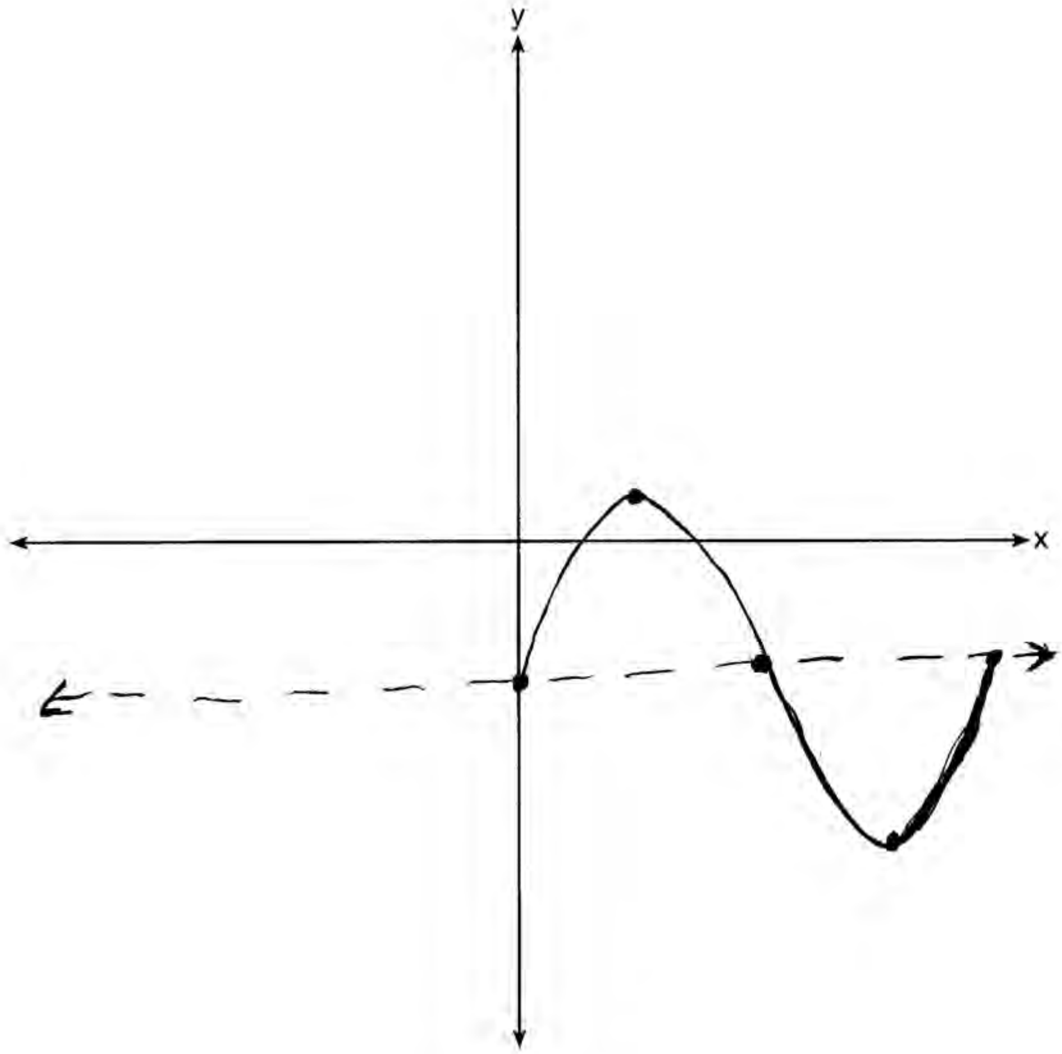
b) Explain any differences between a sketch of $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part *a*.

It is moved $\frac{\pi}{3}$ units to the right (on the x-axis).

Score 4: The student gave a complete and correct response.

Question 35

35 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 2π.



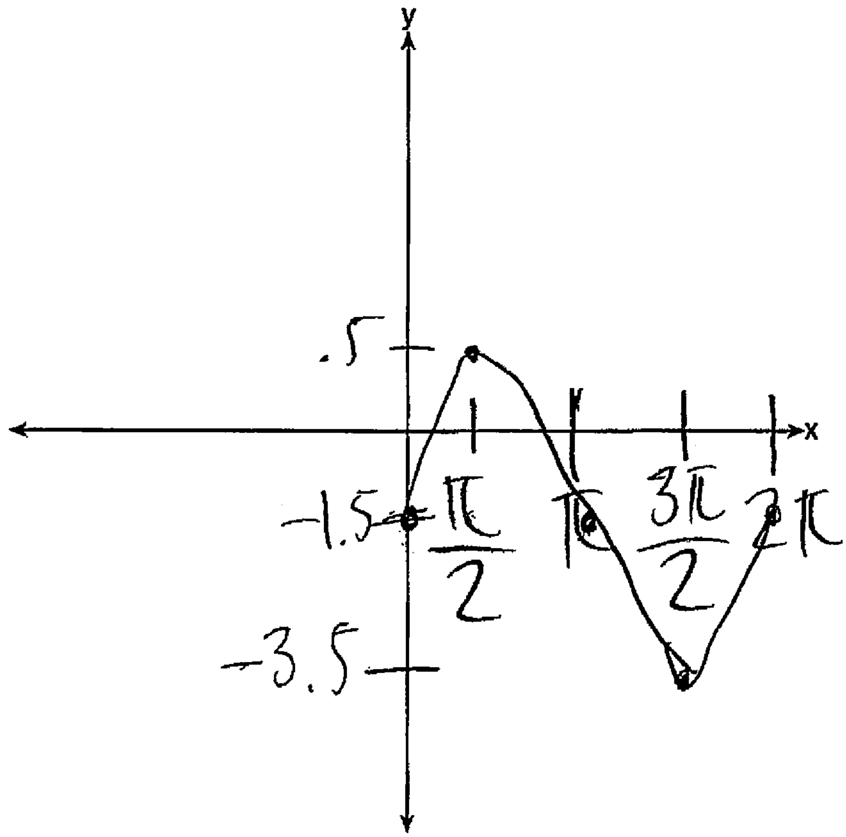
b) Explain any differences between a sketch of $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part *a*.

shifted to the right $\frac{\pi}{3}$

Score 3: The student did not label the sketch.

Question 35

35 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 2π.



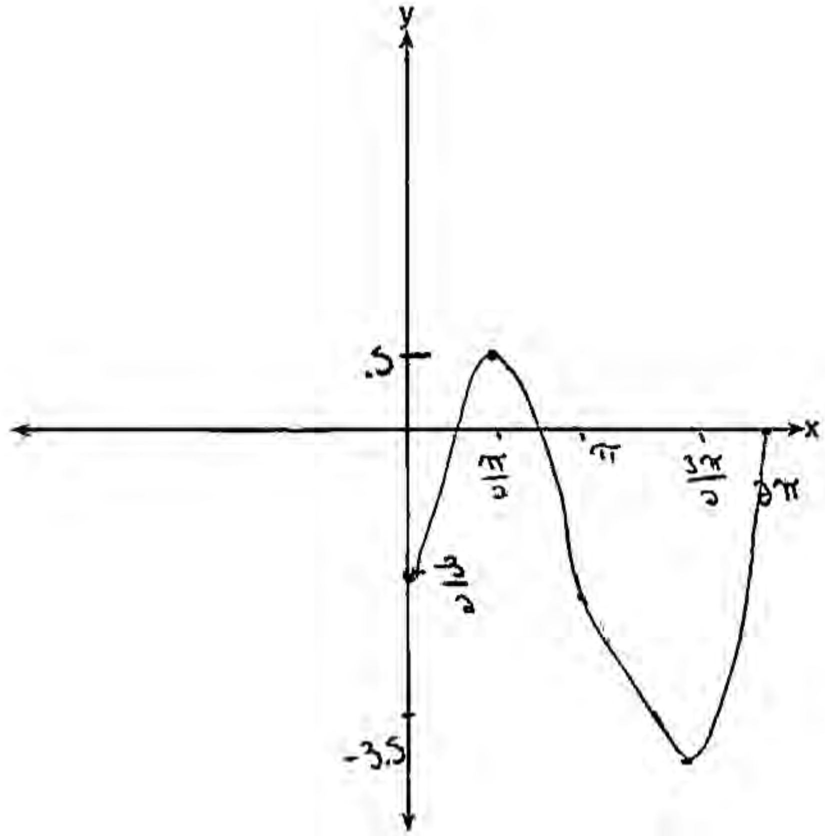
b) Explain any differences between a sketch of $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part *a*.

the values would be doubled

Score 3: The student only received credit for the sketch.

Question 35

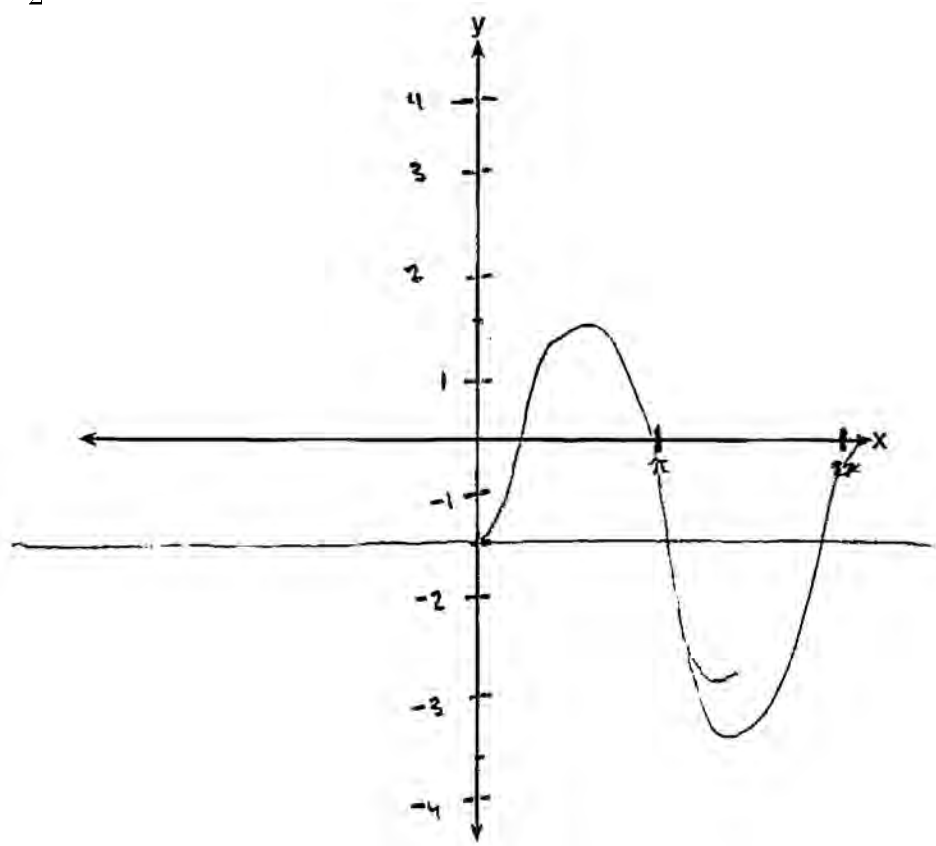
35 a) On the axes below, sketch *at least one* cycle of a sine curve with an amplitude of 2, a midline at $y = -\frac{3}{2}$, and a period of 2π.



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*.

Score 2: The student made one graphing error with no explanation.

35 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 2π.

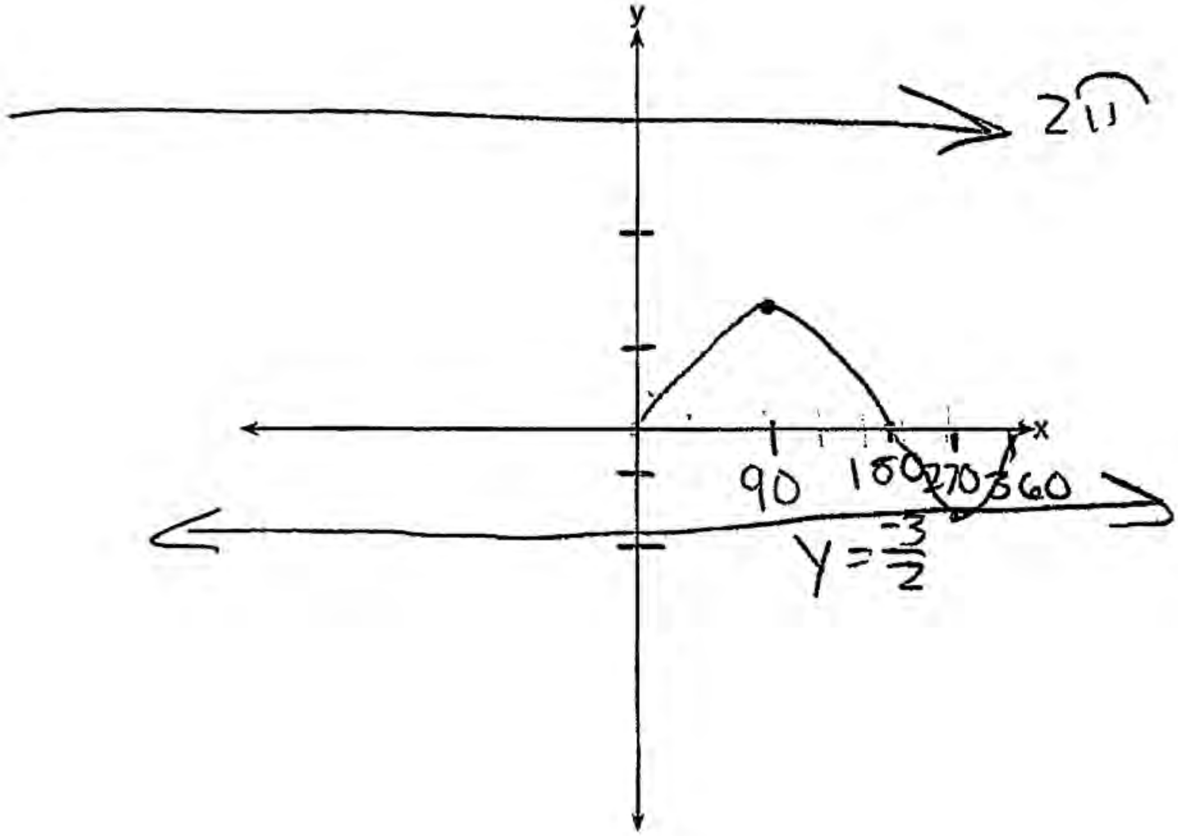


b) Explain any differences between a sketch of $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part *a*.

Score 1: The student made two graphing errors with no explanation.

Question 35

35 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 2π.



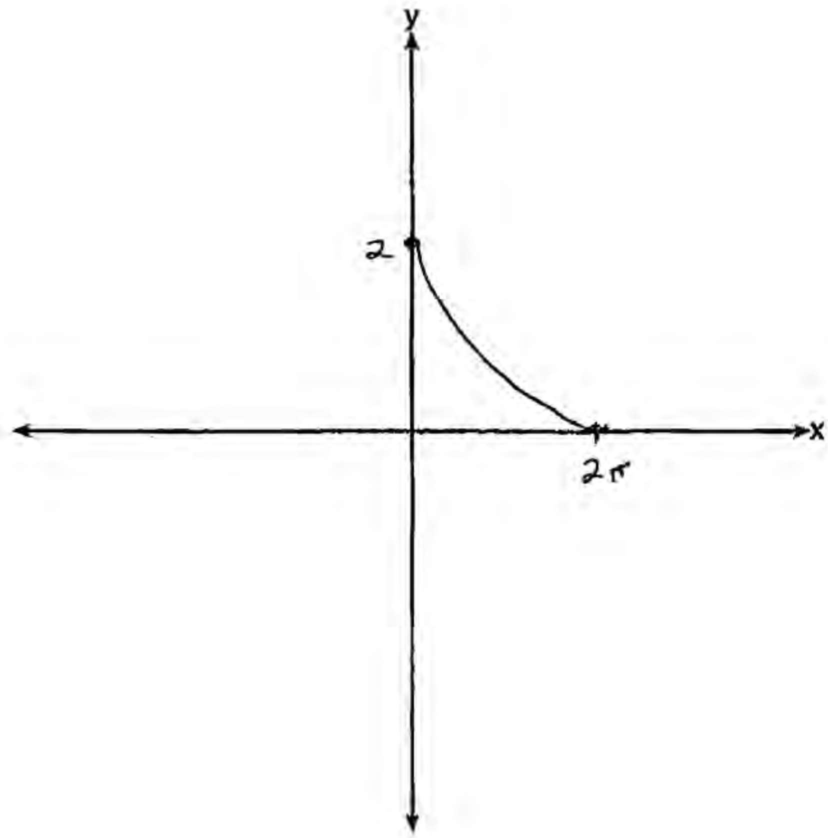
b) Explain any differences between a sketch of $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part *a*.

y = 2sin . . . increases
sketch from a didnot

Score 0: The student made several errors, and wrote an incorrect explanation.

Question 35

35 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 2π.



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*.

when its sin it would start from the bottom in part a started from the top

Score 0: The student gave a completely incorrect response.

Question 36

36 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*.

$y = a(b^x)$ $\quad a = 4.168$

$b = 3.981$

$y = 4.168(3.981)^x$

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.

$y = 4.168(3.981)^x$

$\frac{100}{4.168} = \frac{4.168(3.981)^x}{4.168}$

$23.992 = (3.981)^x$

$\log 23.992 = \log 3.981^x$

$\log 23.992 = x \log 3.981$

$\frac{\log 23.992}{\log 3.981} = \frac{x \log 3.981}{\log 3.981}$

$2.300 = x$

$x = 2.25$ hours or

2 hours + 15 minutes

Score 4: The student gave a complete and correct response.

Question 36

36 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*.

$y = (4.168) \cdot (3.981)^x$

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.

$100 = (4.168)(3.981)^x$

x	y
2.25	93.306
2.5	131.8

2.25 hours

Score 4: The student gave a complete and correct response.

Question 36

36 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.

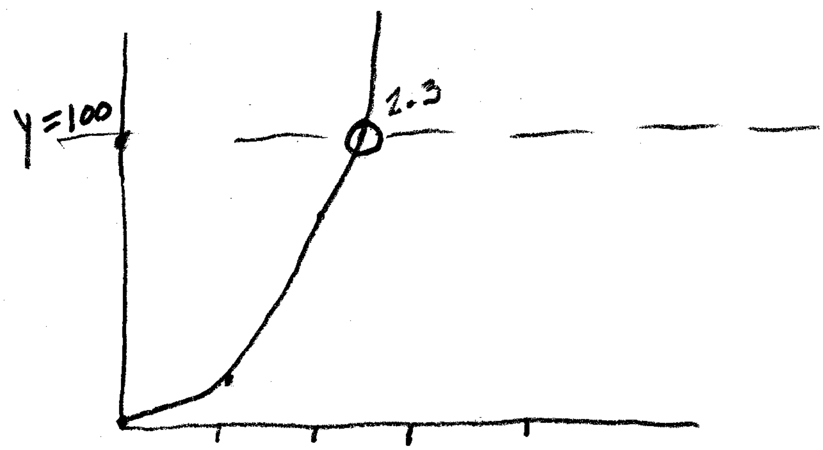
Hours (x)	**Average Number of Spores** (y)
0	4
0.5	10
1	15
2	60
3	260
4	1130
6	16,380

Using these data, write an exponential regression equation, rounding all values to the *nearest thousandth*.

$y = ab^x$

$a = 4.168$

$b = 3.981$



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.

$2.3 \approx 2.25$ hrs

Score 4: The student gave a complete and correct response.

Question 36

36 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*.

$$y = (a)(b^x)$$

$$y = 4.168(3.981)^x$$

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.

$$100 \geq 4.168(3.981)^x$$

$$\frac{100}{4.168} \geq (3.981)^x$$

$$\frac{\log(100 \div 4.168)}{\log(3.981)} \geq x$$

$$x \leq 2.3$$

Score 3: The student did not round to the nearest quarter hour.

Question 36

36 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*.

$\boxed{\text{STAT}}$ $\boxed{1}$ Edit...

$\boxed{\text{STAT}}$ CALC $\boxed{0}$ ExpReg

$y = ab^x$

$y = 4.16798(3.98061)^x$

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.

$y = 4.16798(3.98061)^x$

$100 = 4.16798(3.98061)^x$

$23.99243 = 3.98061^x$

Score 2: The student made an error rounding the coefficients and did not finish solving for *x*.

Question 36

36 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*.

$a \cdot b^x$ $\quad$ $a = 4.674377358$

$b = 3.898204241$

$y = 4.674 \cdot 3.898^x$

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.

$x = 2.25$ hrs

Score 2: The student made a computational error finding the regression equation and wrote 2.25 (based on their equation) without showing work.

Question 36

36 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*.

$y = abx \quad a = 4.167983971 \quad b = 3.98\cancel{0}694\cancel{5}4$

$\boxed{y = 4.168(3.981x)}$

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.

$100 = 4.168(3.98x)$

$\frac{100}{16.592808} = \frac{16.592808x}{16.592808}$

$6.0267074 = x$

$\boxed{6.02 \text{ hours}}$

Score 1: The student received credit for finding and correctly rounding the regression coefficients.

36 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*.

2252.567x- 2758.336

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.

2252.567(100)-2758.336

2252.567(-2658.336)

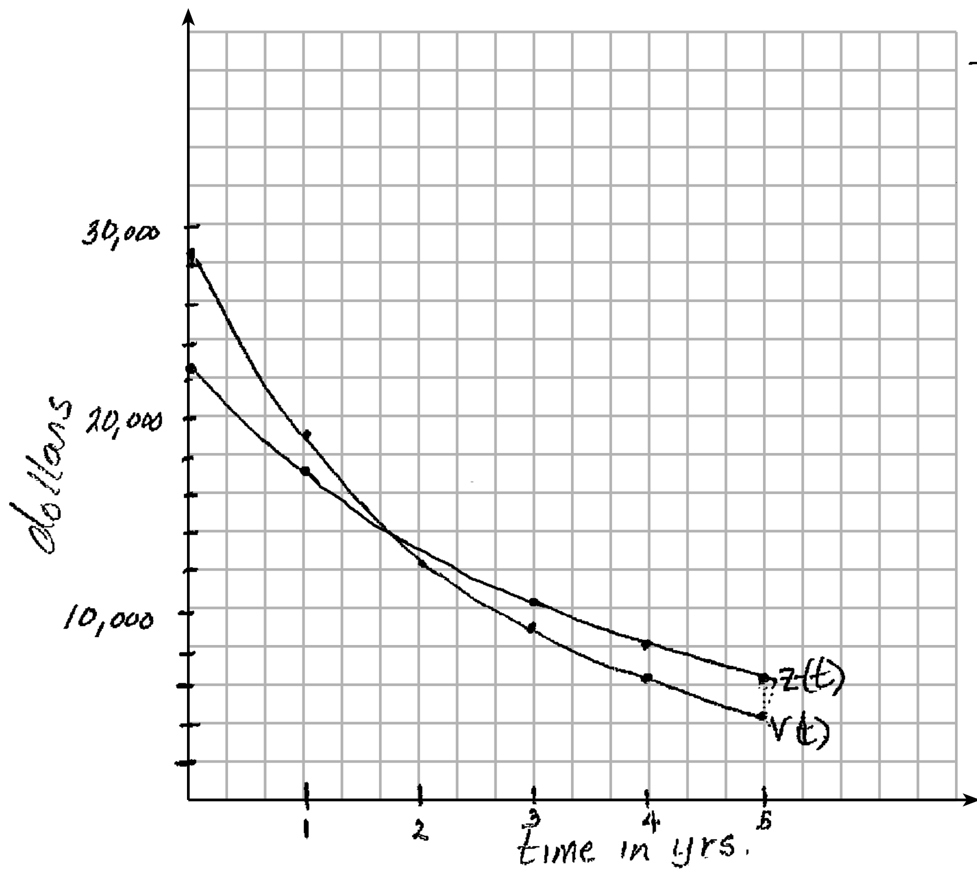
-5988079.949

Score 0: The student showed no correct work.

Question 37

37 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.



t	V(t)
0	28,482.70
1	19,482.17
2	13,325.80
3	9,114.85
4	6,234.56
5	4,264.44

t	Z(t)
0	22,151.33
1	17,233.73
2	13,407.84
3	10,431.30
4	8,115.55
5	6,313.90

Score 6: The student gave a complete and correct response.

Question 37

State where $V(t) = Z(t)$, to the *nearest hundredth*, and interpret its meaning in the context of the problem.

$V(t) = Z(t)$ when $t \approx 1.9523346$

at $t = 1.95$ yrs, the value of the car is exactly equal to the unpaid amount of Zachs loan.

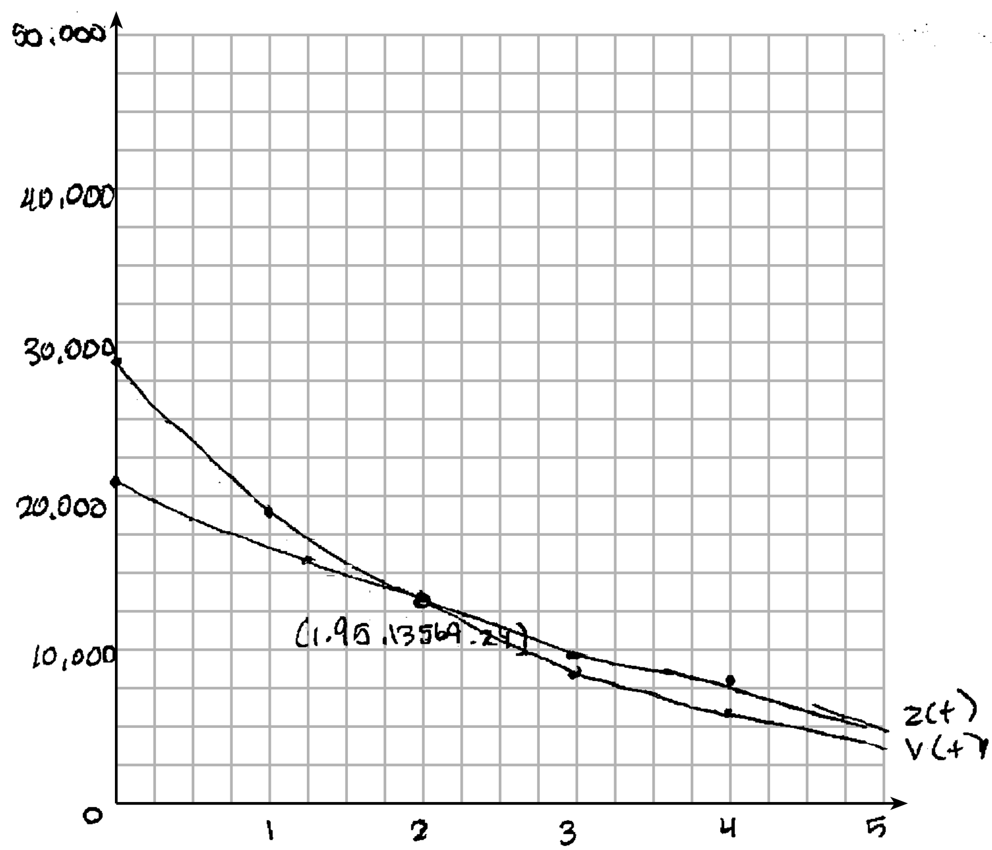
Zach takes out an insurance policy that requires him to pay a \$3000 deductible in case of a collision. Zach will cancel the collision policy when the value of his car equals his deductible. To the *nearest year*, how long will it take Zach to cancel this policy? Justify your answer.

6 yrs because at that point, the value of the car is less than \$3000.

Question 37

37 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 $0 \le t \le 5$, on the set of axes below.



Score 5: The student wrote the answer to the second part as a coordinate pair.

Question 37

State where $V(t) = Z(t)$, to the *nearest hundredth*, and interpret its meaning in the context of the problem.

They intersect at (1.95, 13569.24). This means that the value of the car at that time was the same as the unpaid amount of Zach's at that time.

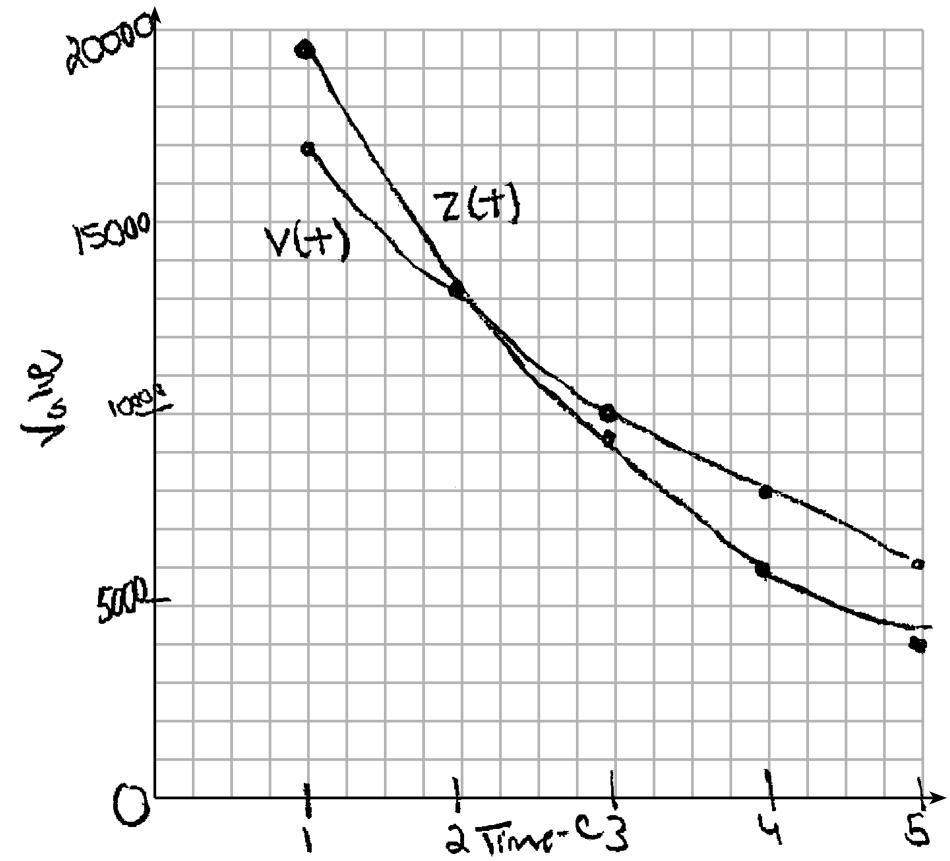
Zach takes out an insurance policy that requires him to pay a \$3000 deductible in case of a collision. Zach will cancel the collision policy when the value of his car equals his deductible. To the *nearest year,* how long will it take Zach to cancel this policy? Justify your answer.

around the 6^{th} year would be reasonable because the value of the car is $\approx$ \$3000.

Question 37

37 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 $0 \le t \le 5$, on the set of axes below.



Score 4: The student made one graphing error, then did not state where the graphs intersect.

Question 37

State where $V(t) = Z(t)$, to the *nearest hundredth*, and interpret its meaning in the context of the problem.

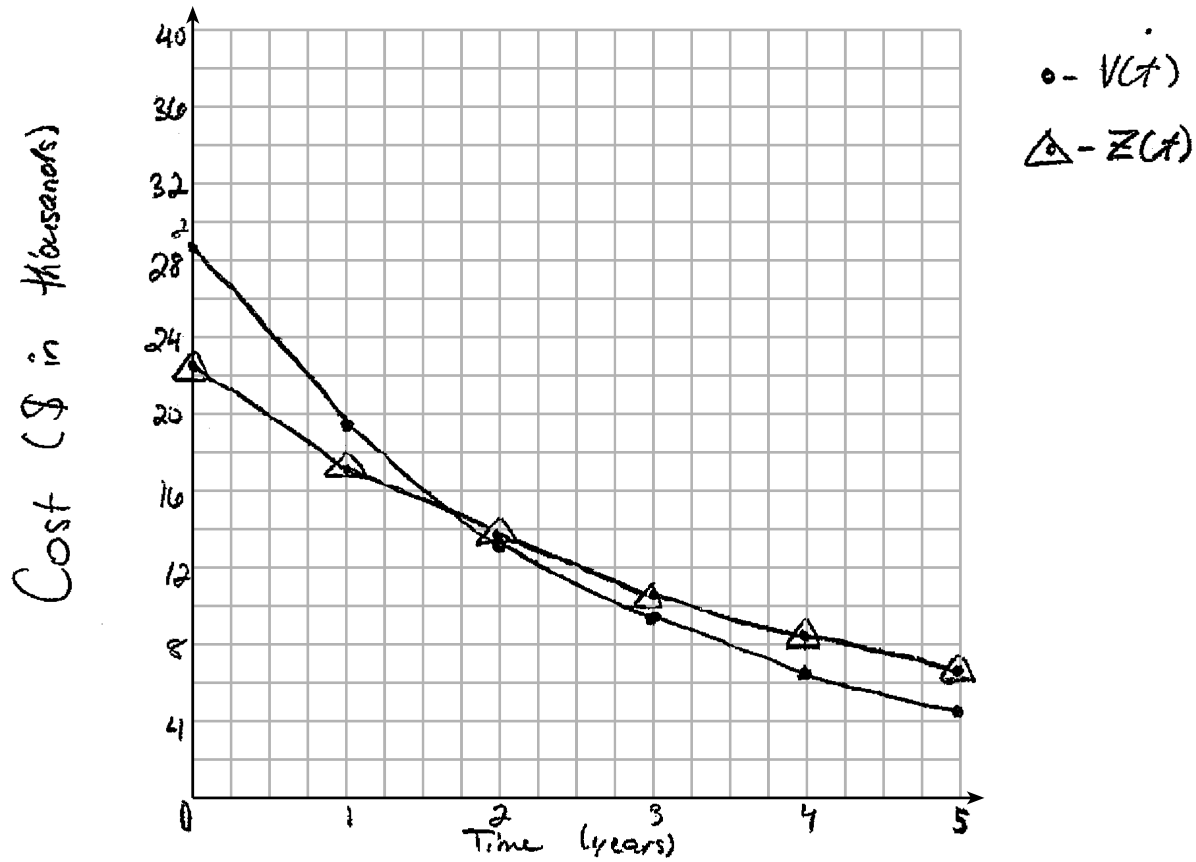
That Zack has a loan equal to the exact value of his purchased model.

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.

By six years his collision policy will equal the value of the model approximately so it is useless.

37 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 $0 \le t \le 5$, on the set of axes below.



Score 3: The student received credit for the graph and the contextual interpretation on the second part.

Question 37

State where $V(t) = Z(t)$, to the *nearest hundredth*, and interpret its meaning in the context of the problem.

$V(t) = Z(t)$ after about 1.5 years. This means that the value of the car is equal to the unpaid amount of Zach's loan.

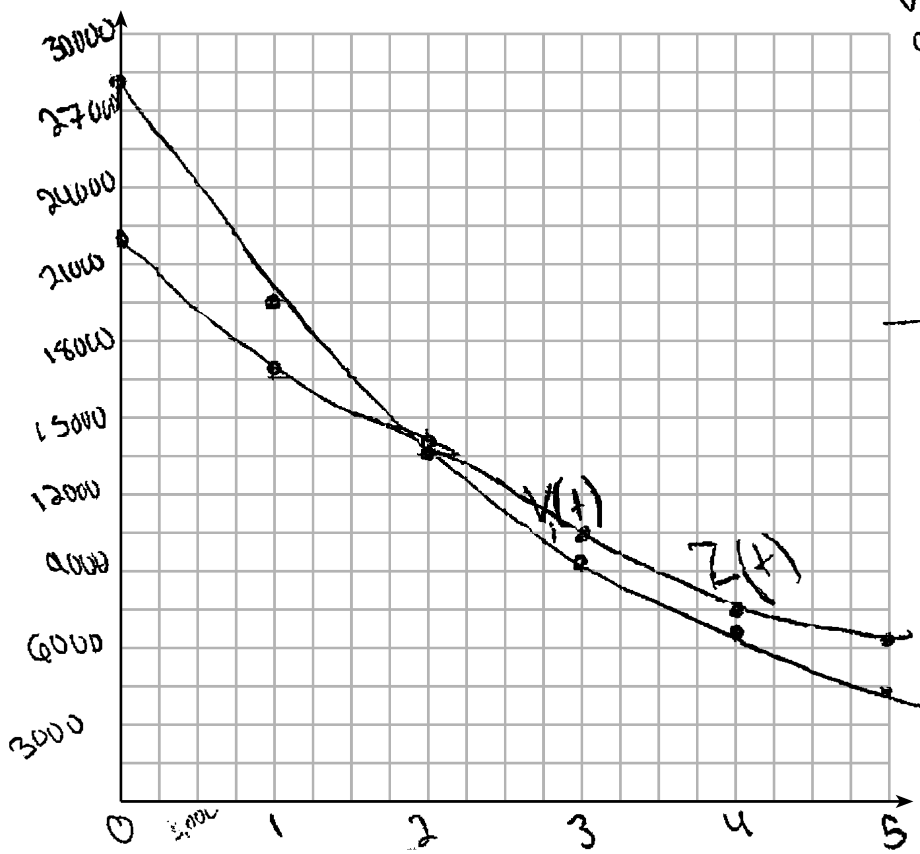
Zach takes out an insurance policy that requires him to pay a \$3000 deductible in case of a collision. Zach will cancel the collision policy when the value of his car equals his deductible. To the *nearest year*, how long will it take Zach to cancel this policy? Justify your answer.

It would be reasonable to cancel the policy after 5 years because. the value of the car is lowest.

Question 37

37 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.



V(t)
0 = 28482.698
1 = 19482.16543
2 = 13325.80116
3 = 9114.84799
6234.5
4264

Z(t)
0 = 22151
1 = 17233
2 = 13407
3 = 10431
4 = 8115.
5 = 6313

Score 2: The student received credit for correctly drawing each graph.

Question 37

State where $V(t) = Z(t)$, to the *nearest hundredth*, and interpret its meaning in the context of the problem.

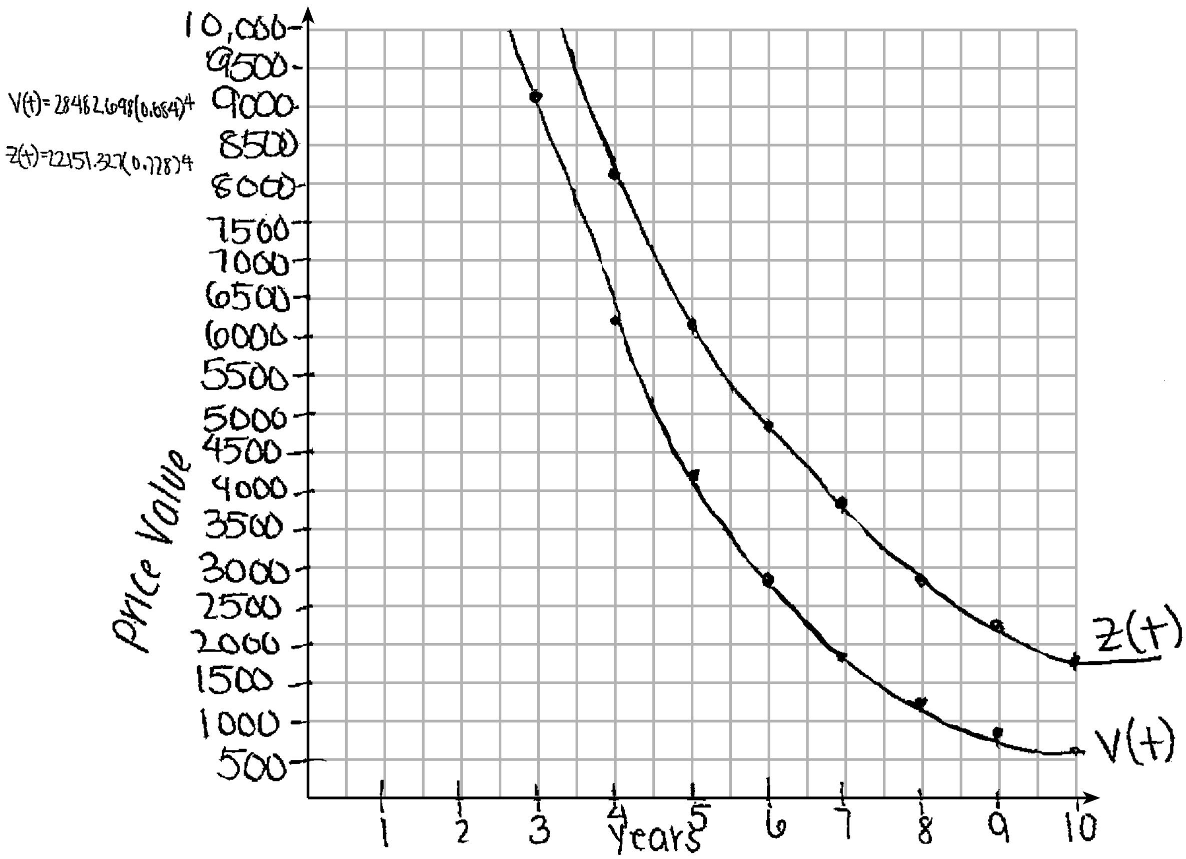
between 2 & 2.5 years

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.

2

37 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.



Score 1: The student earned one point for the graph.

Question 37

State where $V(t) = Z(t)$, to the *nearest hundredth*, and interpret its meaning in the context of the problem.

(1.9523346, 13564.237)

∴ At almost 2 years, the car will be worth \$13,569.24.

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.

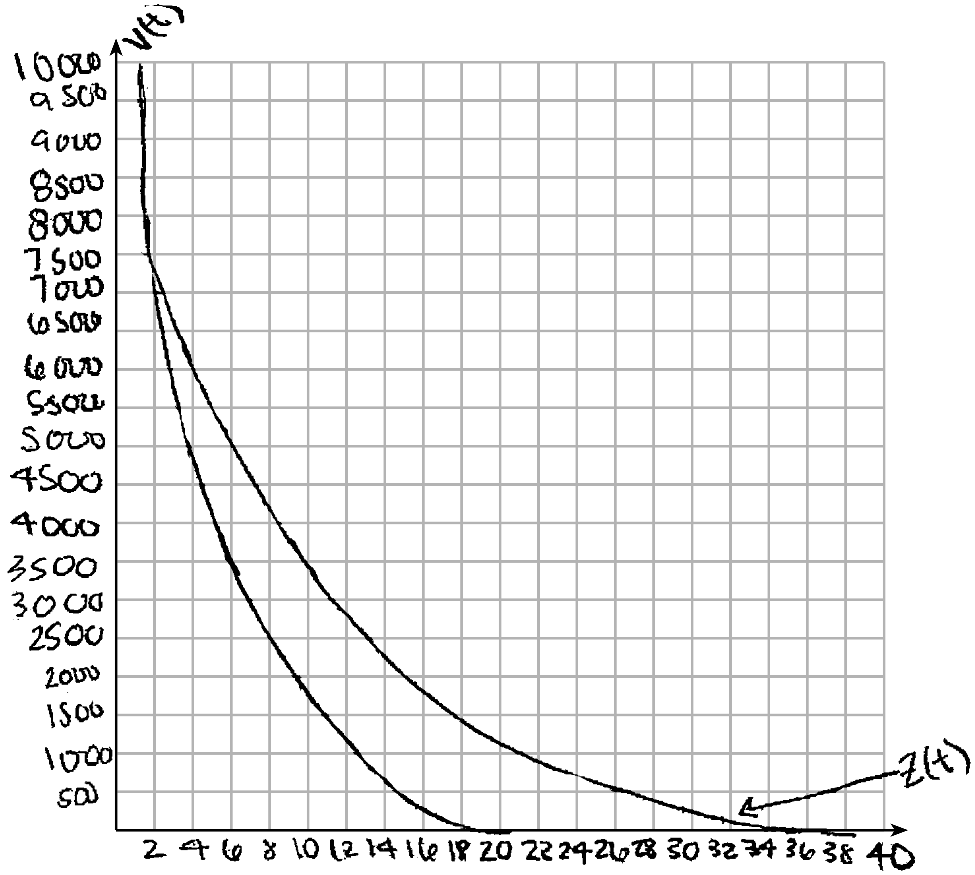
8 years

∴ the car will only cost \$2973.30 which is less than tho insurance.

Question 37

37 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 $0 \le t \le 5$, on the set of axes below.



Score 0: The student made several graphing errors and showed no other correct work.

Question 37

State where $V(t) = Z(t)$, to the *nearest hundredth*, and interpret its meaning in the context of the problem.

(1.95, 13569.24)

where the two costs of the cars meet

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.

After 30 because he would almost be done paying

The State Education Department / The University of the State of New York

Regents Examination in Algebra II – August 2017

Chart for Converting Total Test Raw Scores to Final Exam Scores (Scale Scores)

(Use for the August 2017 exam only.)

Raw Score	Scale Score	Performance Level
86	**100**	5
85	**99**	5
84	**98**	5
83	**97**	5
82	**96**	5
81	**96**	5
80	**95**	5
79	**94**	5
78	**93**	5
77	**93**	5
76	**92**	5
75	**91**	5
74	**91**	5
73	**90**	5
72	**89**	5
71	**89**	5
70	**88**	5
69	**87**	5
68	**87**	5
67	**86**	5
66	**86**	5
65	**86**	5
64	**85**	5
63	**84**	4
62	**84**	4
61	**83**	4
60	**83**	4
59	**82**	4
58	**82**	4

Raw Score	Scale Score	Performance Level
57	**82**	4
56	**81**	4
55	**81**	4
54	**80**	4
53	**80**	4
52	**80**	4
51	**79**	4
50	**79**	4
49	**79**	4
48	**78**	4
47	**78**	4
46	**78**	4
45	**77**	3
44	**77**	3
43	**76**	3
42	**76**	3
41	**76**	3
40	**75**	3
39	**75**	3
38	**74**	3
37	**74**	3
36	**73**	3
35	**73**	3
34	**72**	3
33	**71**	3
32	**71**	3
31	**70**	3
30	**69**	3
29	**68**	3

Raw Score	Scale Score	Performance Level
28	**67**	3
27	**66**	3
26	**66**	3
25	**65**	3
24	**63**	2
23	**62**	2
22	**61**	2
21	**60**	2
20	**58**	2
19	**55**	2
18	**54**	1
17	**53**	1
16	**51**	1
15	**49**	1
14	**47**	1
13	**45**	1
12	**43**	1
11	**40**	1
10	**37**	1
9	**34**	1
8	**31**	1
7	**28**	1
6	**25**	1
5	**21**	1
4	**17**	1
3	**13**	1
2	**9**	1
1	**5**	1
0	**0**	1

To determine the student's final examination score (scale score), find the student's total test raw score in the column labeled "Raw Score" and then locate the scale score that corresponds to that raw score. The scale score is the student's final examination score. Enter this score in the space labeled "Scale Score" on the student's answer sheet.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart change from one administration to another, it is crucial that for each administration the conversion chart provided for that administration be used to determine the student's final score. The chart above is usable only for this administration of the Regents Examination in Algebra II.