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

ALGEBRA II

Wednesday, August 16, 2023 — 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 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 A group of high school students wanted to collect information on how many times per week students exercised. If they want the *least* biased results they should survey every fifth student at the school who is

(1) entering the gym

(2) in the junior class

(3) entering the library

(4) entering the building

2 Given $x \neq -3$, which expression is equivalent to $\frac{2x^3 + 3x^2 - 4x + 5}{x + 3}$?

(1) $2x^3 + 9x^2 + 23x + 74$

(2) $2x^2 - 3x + 5 - \frac{10}{x + 3}$

(3) $2x^3 - 3x^2 + 5x - 10$

(4) $2x^2 + 9x + 23 + \frac{74}{x + 3}$

3 The table below shows the food preferences of sports fans whose favorite sport is football or baseball.

Favorite Food to Eat While Watching Sports

	Wings	Pizza	Hot Dogs
Football	14	20	6
Baseball	6	12	42

The probability that a fan prefers pizza given that the fan prefers football is

(1) $\frac{1}{2}$

(2) $\frac{1}{5}$

(3) $\frac{5}{8}$

(4) $\frac{13}{25}$

Use this space for computations.

4 If $f(x) = 12x - 4$, then the inverse function $f^{-1}(x)$ is

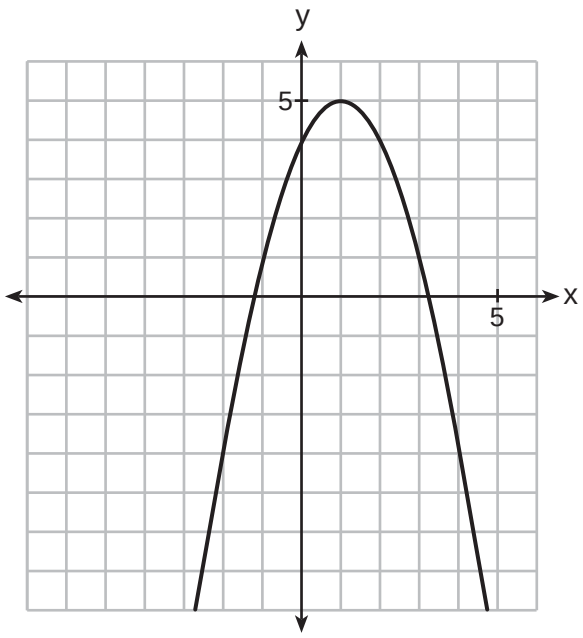
(1) $f^{-1}(x) = \frac{x + 1}{3}$

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

(3) $f^{-1}(x) = \frac{x + 4}{12}$

(4) $f^{-1}(x) = \frac{x}{12} + 4$

5 The graph of a quadratic function is shown below.



When the graph of $x + y = 4$ is drawn on the same axes, one solution to this system is

(1) (4,0)

(2) (1,5)

(3) (2,2)

(4) (3,1)

6 What is the solution of $2(3^{x + 4}) = 56$?

(1) $x = \log_3(28) - 4$

(2) $x = -1$

(3) $x = \log(25) - 4$

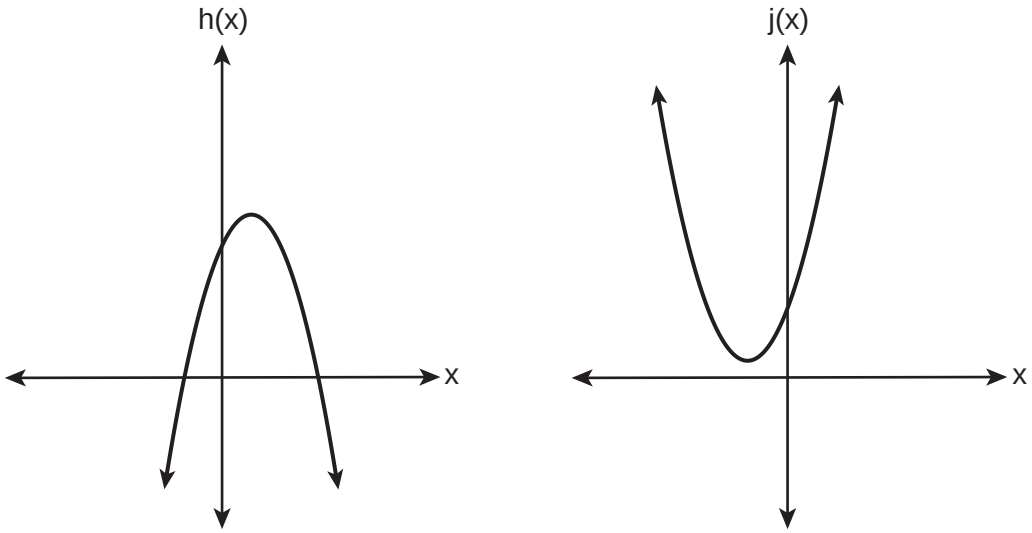
(4) $x = \frac{\log(56)}{\log(6)} - 4$

Use this space for computations.

7 In a survey of people who recently bought a laptop, 45% said they were looking for a large screen, 31% said they were looking for a fast processor, and 58% said they wanted a large screen or a fast processor. If a survey respondent is selected at random, what is the probability that the respondent wanted both a large screen and a fast processor?

(1) 76%
(2) 14%
(3) 77%
(4) 18%

8 In the quadratic formula, $b^2 - 4ac$ is called the discriminant. The function $f(x)$ has a discriminant value of 8, and $g(x)$ has a discriminant value of -16. The quadratic graphs, $h(x)$ and $j(x)$, are shown below.



Which quadratic functions have imaginary roots?

(1) $g(x)$ and $h(x)$
(2) $g(x)$ and $j(x)$
(3) $f(x)$ and $h(x)$
(4) $f(x)$ and $j(x)$

Use this space for computations.

9 The element Americium has a half-life of 25 minutes. Given an initial amount, A_0, which expression could be used to determine the amount of Americium remaining after t minutes?

(1) $A_0\left(\frac{1}{2}\right)^{\frac{t}{25}}$

(2) $A_0(25)^{\frac{t}{2}}$

(3) $25\left(\frac{1}{2}\right)^{t}$

(4) $A_0\left(\frac{1}{2}\right)^{25t}$

10 Which function has the greatest y-intercept?

(1) $f(x) = 4\sin(2x)$

(2) $g(x) = 3x^4 + 2x^3 + 7$

(3) $h(x) = 5e^{2x} + 3$

(4) $j(x) = 6\log_2(3x + 4)$

11 According to the USGS, an agency within the Department of Interior of the United States, the frog population in the U.S. is decreasing at the rate of 3.79% per year. A student created a model, $P = 12{,}150(0.962)^t$, to estimate the population in a pond after t years. The student then created a model that would predict the population after d decades. This model is best represented by

(1) $P = 12{,}150(0.461)^d$

(2) $P = 12{,}150(0.679)^d$

(3) $P = 12{,}150(0.996)^d$

(4) $P = 12{,}150(0.998)^d$

12 What is the value of $\tan\theta$ when $\sin\theta = \frac{2}{5}$ and θ is in quadrant II?

(1) $\frac{-\sqrt{21}}{5}$

(2) $\frac{-\sqrt{21}}{2}$

(3) $\frac{-2}{\sqrt{21}}$

(4) $\frac{2}{\sqrt{21}}$

Use this space for computations.

13 A population is normally distributed with a mean of 23 and a standard deviation of 1.2. The percentage of the population that falls below 21, to the *nearest hundredth*, is

(1) 0.05

(2) 4.78

(3) 8.29

(4) 91.30

14 Audra is interested in studying the number of students entering kindergarten in the Ahlville Central School District over the next several years. Using data dating back to 2015, she determines that the number of kindergarteners is decreasing at an exponential rate. She creates a formula to model this situation $y = a(b)^x$, where x is the number of years since 2015 and y is the number of students entering kindergarten. If there were 105 students entering kindergarten in Ahlville in 2015, which statement about Audra's formula is true?

(1) a is positive and b is negative.

(2) a is negative and b is positive.

(3) Both a and b are positive.

(4) Both a and b are negative.

15 The solution set for the equation $\sqrt{3(x + 6)} = x$ is

(1) {6, –3}

(2) {–6, 3}

(3) {6}

(4) {–3}

Use this space for computations.

16 The George family would like to borrow $45,000 to purchase a new boat. They qualified for a loan with an annual interest rate of 6.75%. The monthly loan payment 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

What is the monthly payment if they would like to pay off the loan in five years?

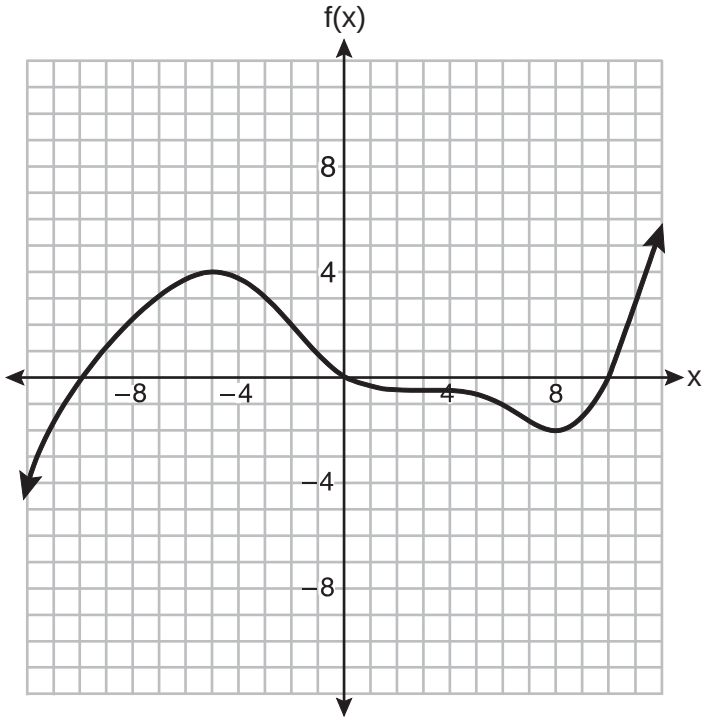
(1) $262.99
(2) $252.13
(3) $915.24
(4) $885.76

17 A retailer advertises that items will be discounted by 10% every Monday until they are sold. In how many weeks will an item costing $50 first be sold for under half price?

(1) 7
(2) 6
(3) 5
(4) 4

Use this space for computations.

18 The graph of the function $f(x)$ is shown below.



In which interval is $f(x)$ always positive?

(1) $(-2,4)$

(2) $(0,10)$

(3) $(-12,-5)$

(4) $(-10,0)$

19 If $f(x) = (x^2 + 3x + 2)(x^2 - 4x + 3)$ and $g(x) = x^2 - 9$, then how many real solutions are there to the equation $f(x) = g(x)$?

(1) 1

(2) 2

(3) 6

(4) 4

Use this space for computations.

20 Which expression is a factor of $x^4 - x^3 - 11x^2 + 5x + 30$?

(1) $x + 2$

(2) $x - 2$

(3) $x + 5$

(4) $x - 5$

21 The expression $\frac{x^2 + 6}{x^2 + 4}$ is equivalent to

(1) $\frac{6}{4}$

(2) $1 + \frac{10}{x^2 + 4}$

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

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

22 Stone Manufacturing has developed a cost model, $C(x) = 0.18x^3 + 0.02x^2 + 4x + 180$, where x is the number of sprockets sold, in thousands. The sale price can be modeled by $S(x) = 95.4 - 6x$ and the company's revenue by $R(x) = x \bullet S(x)$. The company profits, $R(x) - C(x)$, could be modeled by

(1) $0.18x^3 + 6.02x^2 + 91.4x + 180$

(2) $0.18x^3 - 5.98x^2 - 91.4x + 180$

(3) $-0.18x^3 - 6.02x^2 + 91.4x - 180$

(4) $0.18x^3 + 5.98x^2 + 99.4x + 180$

23 Which function is even?

(1) $f(x) = x^3 + 2$

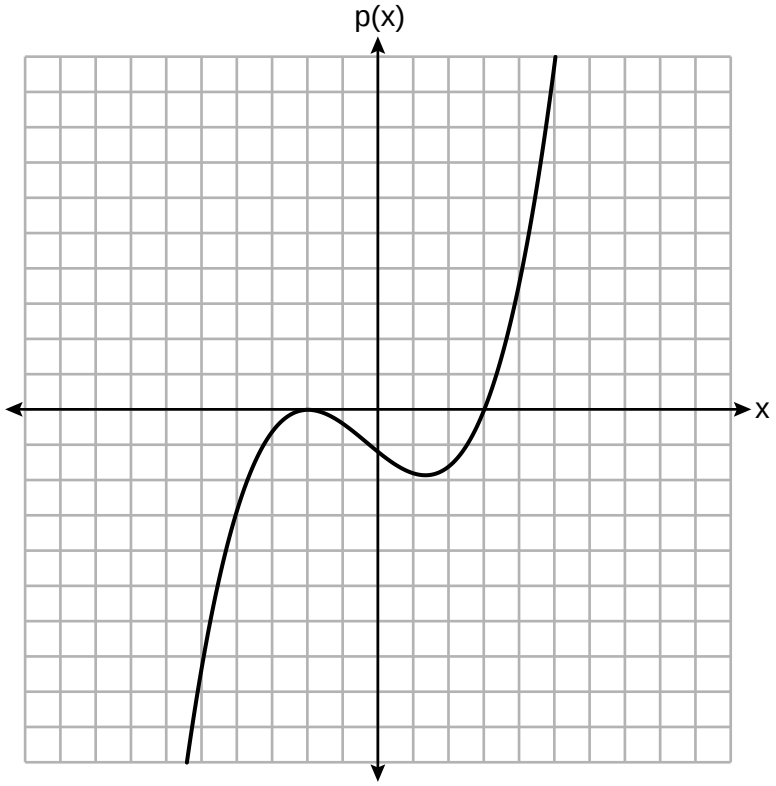
(2) $f(x) = x^2 + 1$

(3) $f(x) = |x + 2|$

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

Use this space for computations.

24 The graph of a cubic polynomial function $p(x)$ is shown below.



If $p(x)$ is written as a product of linear factors, which factor would appear twice?

(1) $x - 2$

(2) $x + 2$

(3) $x - 3$

(4) $x + 3$

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]

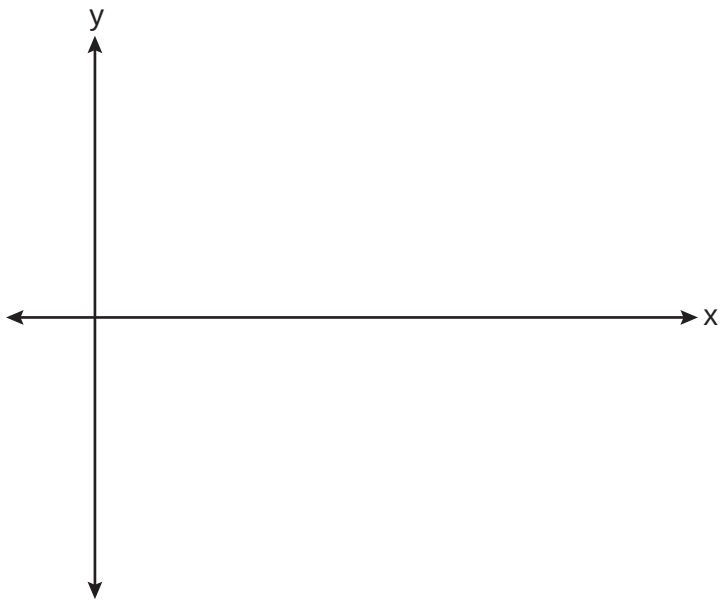
25 Factor the expression $2x^3 - 3x^2 - 18x + 27$ completely.

26 Algebraically determine the values of x that satisfy the system of equations shown below:

$$y = x^2 + 8x - 5$$
$$y = 8x - 4$$

27 Solve the equation $3x^2 + 5x + 8 = 0$. Write your solution in $a + bi$ form.

28 On the coordinate plane below, sketch *at least one cycle* of a cosine function with a midline at $y = -2$, an amplitude of 3, and a period of $\frac{\pi}{2}$.



29 Given i is the imaginary unit, simplify $(5xi^3 - 4i)^2$ as a polynomial in standard form.

30 Consider the parabola given by $y = \frac{1}{4}x^2 + x + 8$ with vertex $(-2,7)$ and focus $(-2,8)$. Use this information to explain how to determine the equation of the directrix.

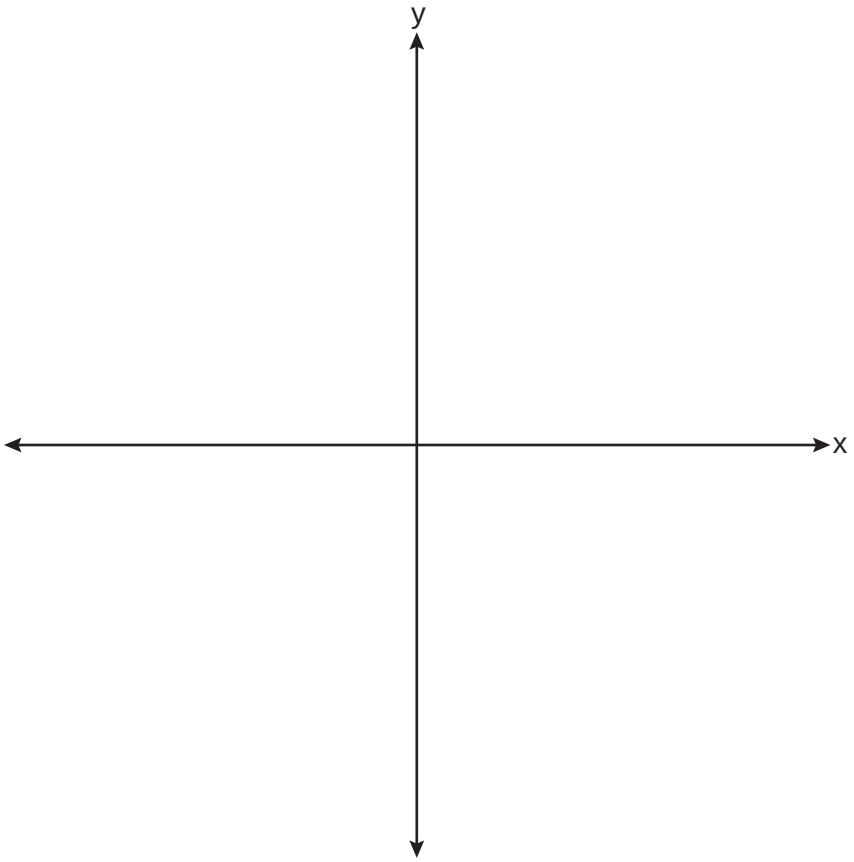
31 Write $\frac{x\sqrt{x^3}}{\sqrt[3]{x^5}}$ as a single term in simplest form, with a rational exponent.

32 A fruit fly population can be modeled by the equation $P = 10(1.27)^t$, where P represents the number of fruit flies after t days. What is the average rate of change of the population, rounded to the *nearest hundredth*, over the interval [0,10.5]? Include appropriate units in your answer.

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 Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.



Describe the end behavior of $p(x)$ as $x \to -3$.

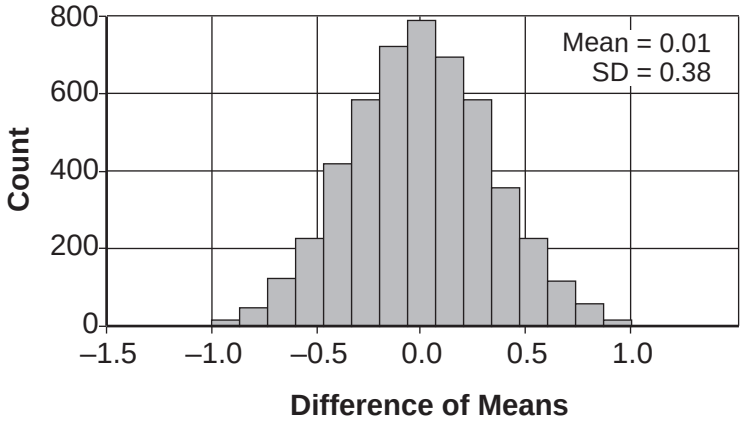
Describe the end behavior of $p(x)$ as $x \to \infty$.

34 Solve for x algebraically: $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2 - 8x + 12}$

35 Solve the following system of equations algebraically for x, y, and z.

$$2x + 4y - 3z = 12$$
$$3x - 2y + 2z = -9$$
$$-x + y - 3z = 0$$

36 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*.

Does the interval indicate that the difference between the classes' grades is significant? Explain.

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 Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested \$8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.

Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.

Question 37 is continued on the next page.

Question 37 continued

Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

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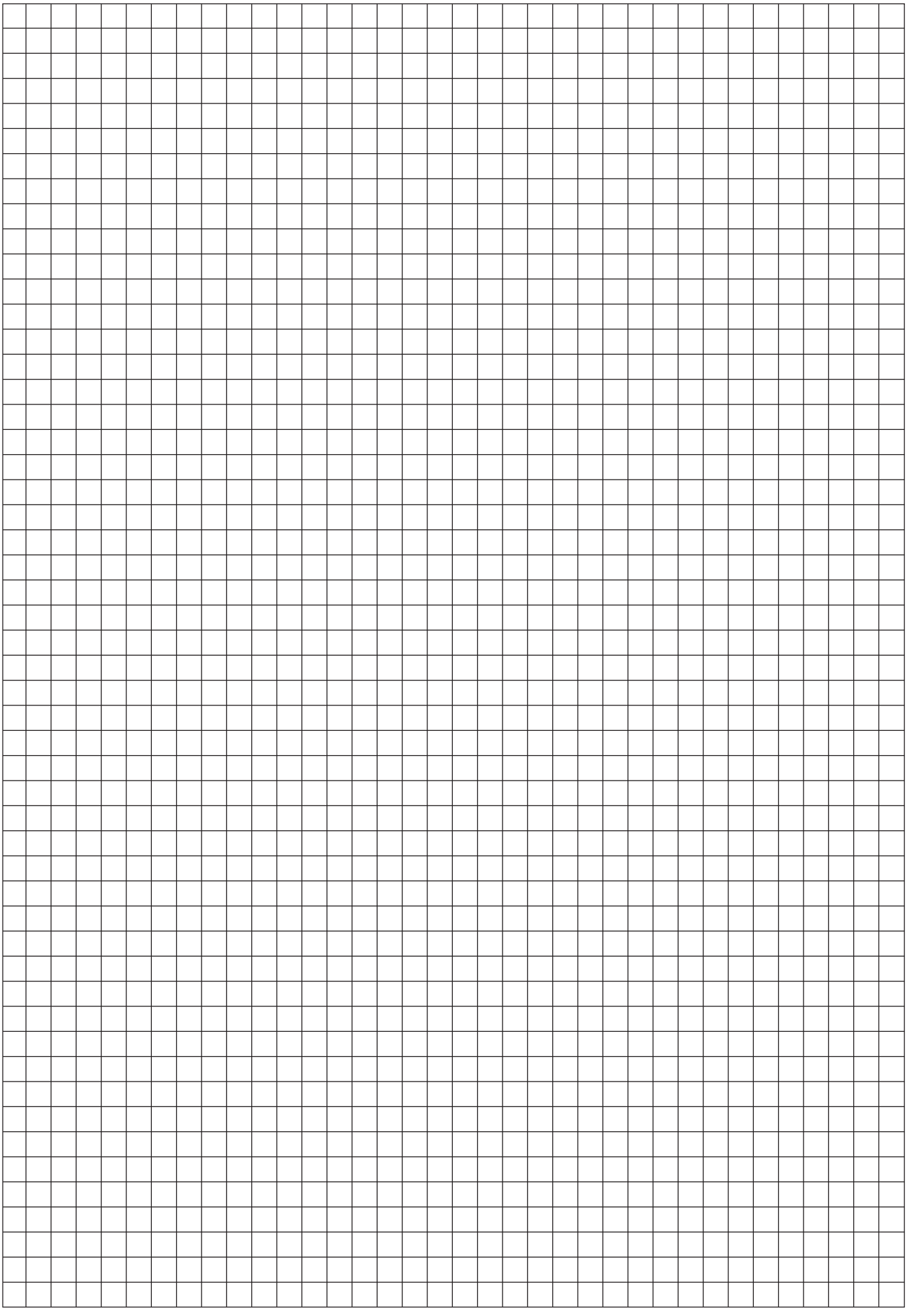

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High School Math Reference Sheet

1 inch = 2.54 centimeters
1 meter = 39.37 inches
1 mile = 5280 feet
1 mile = 1760 yards
1 mile = 1.609 kilometers

1 kilometer = 0.62 mile
1 pound = 16 ounces
1 pound = 0.454 kilogram
1 kilogram = 2.2 pounds
1 ton = 2000 pounds

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts
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	$S_n = \frac{a_1 - a_1 r^n}{1 - \mathrm{r}}$ where $r \neq 1$
Radians	1 radian $= \frac{180}{\pi}$ degrees
Degrees	1 degree $= \frac{\pi}{180}$ radians
Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$

ALGEBRA II

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ALGEBRA II

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

Regents Examination in Algebra II – August 2023

Scoring Key: Part I (Multiple-Choice Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Algebra II	August '23	**1**	4	MC	2	1
Algebra II	August '23	**2**	2	MC	2	1
Algebra II	August '23	**3**	1	MC	2	1
Algebra II	August '23	**4**	3	MC	2	1
Algebra II	August '23	**5**	4	MC	2	1
Algebra II	August '23	**6**	1	MC	2	1
Algebra II	August '23	**7**	4	MC	2	1
Algebra II	August '23	**8**	2	MC	2	1
Algebra II	August '23	**9**	1	MC	2	1
Algebra II	August '23	**10**	4	MC	2	1
Algebra II	August '23	**11**	2	MC	2	1
Algebra II	August '23	**12**	3	MC	2	1
Algebra II	August '23	**13**	2	MC	2	1
Algebra II	August '23	**14**	3	MC	2	1
Algebra II	August '23	**15**	3	MC	2	1
Algebra II	August '23	**16**	4	MC	2	1
Algebra II	August '23	**17**	1	MC	2	1
Algebra II	August '23	**18**	4	MC	2	1
Algebra II	August '23	**19**	2	MC	2	1
Algebra II	August '23	**20**	1	MC	2	1
Algebra II	August '23	**21**	4	MC	2	1
Algebra II	August '23	**22**	3	MC	2	1
Algebra II	August '23	**23**	2	MC	2	1
Algebra II	August '23	**24**	2	MC	2	1

Regents Examination in Algebra II – August 2023

Scoring Key: Parts II, III, and IV (Constructed-Response Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Algebra II	August '23	**25**	-	CR	2	1
Algebra II	August '23	**26**	-	CR	2	1
Algebra II	August '23	**27**	-	CR	2	1
Algebra II	August '23	**28**	-	CR	2	1
Algebra II	August '23	**29**	-	CR	2	1
Algebra II	August '23	**30**	-	CR	2	1
Algebra II	August '23	**31**	-	CR	2	1
Algebra II	August '23	**32**	-	CR	2	1
Algebra II	August '23	**33**	-	CR	4	1
Algebra II	August '23	**34**	-	CR	4	1
Algebra II	August '23	**35**	-	CR	4	1
Algebra II	August '23	**36**	-	CR	4	1
Algebra II	August '23	**37**	-	CR	6	1

Key
MC = Multiple-choice question
CR = Constructed-response question

The chart for determining students' final examination scores for the **August 2023 Regents Examination in Algebra II** will be posted on the Department's web site at: https://www.nysedregents.org/algebratwo/ on the day of the examination. Conversion charts provided for the previous administrations of the Regents Examination in Algebra II must NOT be used to determine students' final scores for this administration.

FOR TEACHERS ONLY

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

ALGEBRA II

Wednesday, August 16, 2023 — 12:30 to 3:30 p.m., only

RATING GUIDE

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: https://www.nysed.gov/state-assessment/high-school-regents-examinations 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 intended 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 https://www.nysedregents.org/algebratwo/.

Note: The rubric definition for a 0-credit response has been updated based on feedback from New York State mathematics educators.

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 constructed-response 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: https://www.nysed.gov/state-assessment/ by Wednesday, August 16, 2023. 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.

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]** $(x + 3)(x - 3)(2x - 3)$, and correct work is shown.

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

or

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

or

[1] $(x + 3)(x - 3)(2x - 3)$ is written, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(26) **[2]** ± 1 and correct algebraic work is shown.

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

or

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

or

[1] Appropriate work is shown, but a method other than algebraic is used.

or

[1] Appropriate work is shown to find only one of the solutions.

or

[1] ± 1, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(27) **[2]** $\frac{-5}{6} \pm \frac{\sqrt{71}}{6}i$ or equivalent 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] Appropriate work is shown to find $\frac{-5 \pm i\sqrt{71}}{6}$, but no further correct work is shown.

or

[1] $\frac{-5}{6} \pm \frac{\sqrt{71}}{6}i$, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(28) **[2]** A correct sketch is drawn.

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

or

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

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(29) **[2]** $-25x^2 - 40x - 16$ and correct work is shown.

[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 the polynomial is not written in standard form.

or

[1] $-25x^2 - 40x - 16$, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(30) **[2]** A correct explanation is written.

[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] An incomplete explanation is written.

or

[1] Appropriate work is shown to find $y = 6$, but no explanation is written.

[0] $y = 6$, but no work is shown.

or

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(31) **[2]** $x^{\frac{5}{6}}$, and correct work is shown.

[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] $x^{\frac{5}{6}}$, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(32) **[2]** 10.76 fruit flies per day, 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] Appropriate work is shown to find 10.76, but the units are missing or incorrect.

or

[1] 10.76 fruit flies per day, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, 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]** A correct sketch is drawn and correct descriptions are given.

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

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

or

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

or

[2] A correct sketch is drawn, but no further correct work is shown.

or

[2] Correct descriptions are given, but no further correct work is shown.

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

or

[1] One correct description is given, but no further correct work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(34) **[4]** −1, and correct work is shown.

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

or

[3] Appropriate work is shown, but 6 is not rejected.

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

or

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

or

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

or

[2] −1, but a method other than algebraic is used.

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

or

[1] −1, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(35) **[4]** $x = -1, y = 5, z = 2$, and correct work is shown.

[3] Appropriate work is shown to find two of the variables, but no further correct work is shown.

or

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

[2] Appropriate work is shown to find one of the variables, but no further correct work is shown.

or

[2] $x = -1, y = 5, z = 2$, but a method other than algebraic is shown.

or

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

or

[1] $x = -1, y = 5, z = 2$, but no work is shown.

or

[1] Appropriate work is shown to eliminate one variable to create a system of two equations, but no further correct work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(36) **[4]** A correct interval is determined, such as $(-0.75, 0.77)$, and correct work is shown, a negative response is indicated, and a correct explanation is written.

[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] Appropriate work is shown to find $(-0.75, 0.77)$, but no further correct work is shown.

or

[2] An appropriate answer and explanation are given based on an incorrect interval, but no further correct work is shown.

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

or

[1] An incomplete explanation is given, but no further correct work is shown.

or

[1] $(-0.75, 0.77)$, but no work is shown.

[0] No, but no explanation is written.

or

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, 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]** $A(t) = 8000(1.0105)^{4t}$ or equivalent, $B(t) = 8000e^{.039t}$, Abby's account is worth 828.63 more, and $t = 28.2$ with correct work shown.

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

or

[5] Appropriate work is shown, but an approach other than algebraic is used to find 28.2.

or

[5] Appropriate work is shown, but Abby is not indicated.

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

or

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

or

[4] Appropriate work is shown to find $A(t)$ and $B(t)$ and Abby and 828.63, but no further correct work is shown.

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

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

or

[2] Appropriate work is shown to find $A(t)$ and $B(t)$, but no further correct work is shown.

or

[2] Appropriate work is shown to find Abby and 828.63, but no further correct work is shown.

or

[2] Appropriate work is shown to find 28.2, but no further correct work is shown.

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

or

[1] $A(t)$ or $B(t)$, but no further correct work is shown.

or

[1] 828.63 or 28.2, but no further correct work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

Map to the Learning Standards
Algebra II
August 2023

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

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

Regents Examination in Algebra II

August 2023

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

The *Chart for Determining the Final Examination Score for the August 2023 Regents Examination in Algebra II* will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/ by Wednesday, August 16, 2023. 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 https://www.surveymonkey.com/r/8LNLLDW.

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, 2023 — 12:30 to 3:30 p.m.

MODEL RESPONSE SET

Table of Contents

Question 25

25 Factor the expression $2x^3 - 3x^2 - 18x + 27$ completely.

$x^2(2x-3)-9(2x-3)$

$(x^2-9)(2x-3)$

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

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

Question 25

25 Factor the expression $2x^3 - 3x^2 - 18x + 27$ completely.

$x^2(2x^3-3x^2)+(-18x+27)$

$x^2(2x-3) \quad -9(2x-3)$

$(2x-3)(x^2-9)$

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

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

Question 25

25 Factor the expression $2x^3 - 3x^2 - 18x + 27$ completely.

$2x^3 - 3x^2 - 18x + 27$
$= x^2(2x-3) - 9(2x-3)$
$= (x^2 - 9)(2x-3)$

Score 1: The student did not factor completely.

Question 25

25 Factor the expression $2x^3 - 3x^2 - 18x + 27$ completely.

$2x^3 - 3x^2 \mid -18x + 27$

$x^2(2x - 3) \mid -9(2x - 3)$

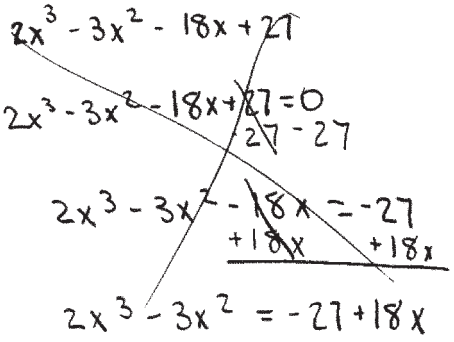
$(x^2 - 9)(2x - 3)$

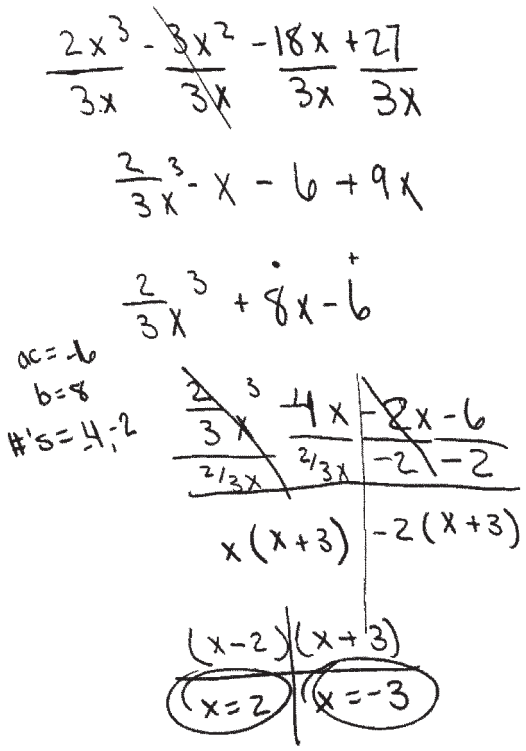
$(x^2 + 3)(x^2 - 3)(2x - 3)$

Score 1: The student made one factoring error.

Question 25

25 Factor the expression $2x^3 - 3x^2 - 18x + 27$ completely.





Score 0: The student made multiple errors.

Question 25

25 Factor the expression $2x^3 - 3x^2 - 18x + 27$ completely.

$2x^3 - 3x - 18x + 27$

$x(2x^2 - 3)\ 3(-6x + 9) = 0$

$x + 3(2x^2 - 3)(6x + 9) = 0$

( )( )

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 26

26 Algebraically determine the values of x that satisfy the system of equations shown below:

$$y = x^2 + 8x - 5$$
$$y = 8x - 4$$

$x^2 + 8x - 5 = 8x - 4$

$x^2 - 1 = 0$

$x^2 = 1$

$x = \pm 1$

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

Question 26

26 Algebraically determine the values of x that satisfy the system of equations shown below:

$$y = x^2 + 8x - 5$$
$$y = 8x - 4$$

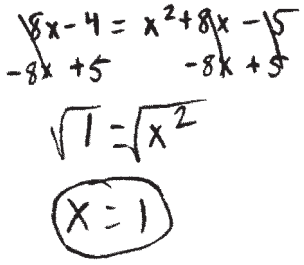
$x^2+8x-5=8x-4$
$-5x+4-8x+4$
$x^2-1=0$
$(x-1)(x+1)=0$
$\{1,-1\}$

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

Question 26

26 Algebraically determine the values of x that satisfy the system of equations shown below:

$$y = x^2 + 8x - 5$$
$$y = 8x - 4$$



Score 1: The student did not indicate $x = -1$.

Question 26

26 Algebraically determine the values of x that satisfy the system of equations shown below:

$$y = x^2 + 8x - 5$$
$$y = 8x - 4$$

$8x - 4 = x^2 + 8x - 5$

$x^2 + 8x - 8x - 5 + 4 = 0$

$x^2 - 1 = 0$

$(x - 1)(x + 1)$

$x^2 + x - x - 1$

$x = 1$ $x = -1$ ✗

Score 1: The student rejected a correct solution.

Question 26

26 Algebraically determine the values of x that satisfy the system of equations shown below:

$$y = x^2 + 8x - 5$$
$$y = 8x - 4$$

$y = 1^2 + 8(1) - 5 = 1 + 8 - 5 = \boxed{4}$

$y = 8(1) - 4 = 8 - 4 = \boxed{4}$

$X = 1$

Score 0 : The student did not solve algebraically and only stated one correct solution.

Question 26

26 Algebraically determine the values of x that satisfy the system of equations shown below:

$$y = x^2 + 8x - 5$$
$$y = 8x - 4$$

$x^2+8x-5 = 8x-4$
$-8x \quad -8x$

$x^2-5=4$
$+5 \quad +5$

$\sqrt{x^2}=\sqrt{9}$

$x = 3$

Score 0: The student made a transcription error writing -4 as 4 and did not state two solutions.

Question 27

27 Solve the equation $3x^2 + 5x + 8 = 0$. Write your solution in $a + bi$ form.

$$\frac{3x^2+5x+8}{3}=\frac{0}{3}$$

$$x^2+\frac{5}{3}x+\frac{8}{3}=0$$

$$x^2+\frac{5}{3}x=\frac{-8}{3}=\frac{-96}{36}$$

$$x^2+\frac{10}{6}x+\frac{25}{36}=\frac{-71}{36}$$

$$\left(x+\frac{5}{6}\right)^2=\frac{-71}{36}$$

$$x+\frac{5}{6}=\pm\sqrt{\frac{-71}{36}}$$

$$x+\frac{5}{6}=\pm i\frac{\sqrt{71}}{6}$$

$$x=\frac{-5}{6}\pm\left(\frac{\sqrt{71}}{6}\right)i$$

$$x\in\left\{\frac{-5}{6}-\left(\frac{\sqrt{71}}{6}\right)i,\ \frac{-5}{6}+\left(\frac{\sqrt{71}}{6}\right)i\right\}$$

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

Question 27

27 Solve the equation $3x^2 + 5x + 8 = 0$. Write your solution in $a + bi$ form.

$3x^2+5x+8=0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$x = \frac{-5 \pm \sqrt{5^2-4(3)(8)}}{2(3)}$

$x = \frac{-5 \pm \sqrt{-71}}{6}$

$\boxed{x = -\frac{5}{6} \pm \frac{i\sqrt{71}}{6}}$

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

Question 27

27 Solve the equation $3x^2 + 5x + 8 = 0$. Write your solution in $a + bi$ form.

$x = \frac{-5 \pm \sqrt{5^2 - 4(3)(8)}}{2(3)} = \frac{-5 \pm \sqrt{-71}}{6} = \frac{-5 \pm 71i}{6}$

$\frac{-5}{6} \pm \frac{71i}{6}$

Score 1: The student eliminated the radical.

Question 27

27 Solve the equation $3x^2 + 5x + 8 = 0$. Write your solution in $a + bi$ form.

$X = \frac{-5 \pm \sqrt{5^2-4(3)(8)}}{2(3)}$ $\frac{-5 \pm \sqrt{25-96}}{6}$ $\frac{-5 \pm \sqrt{-71}}{6}$

$\frac{-5 \pm \sqrt{71}\, i}{6}$ $x_1 = \frac{-5+\sqrt{71}\, i}{6}$

$x_2 = \frac{-5-\sqrt{71}\, i}{6}$

Score 1: The student did not express the answer in $a + bi$ form.

Question 27

27 Solve the equation $3x^2 + 5x + 8 = 0$. Write your solution in $a + bi$ form.

$$\frac{-(b) \pm \sqrt{(b)^2 - 4ac}}{2a}$$

$$\frac{-(5) \pm \sqrt{(5)^2 - 4(3)(8)}}{2(3)} = \frac{-5 \pm \sqrt{-71}}{6}$$

$$\frac{-5 \pm 71i}{6}$$

Score 0: The student eliminated the radical and did not express the answer in $a + bi$ form.

Question 27

27 Solve the equation $3x^2 + 5x + 8 = 0$. Write your solution in $a + bi$ form.

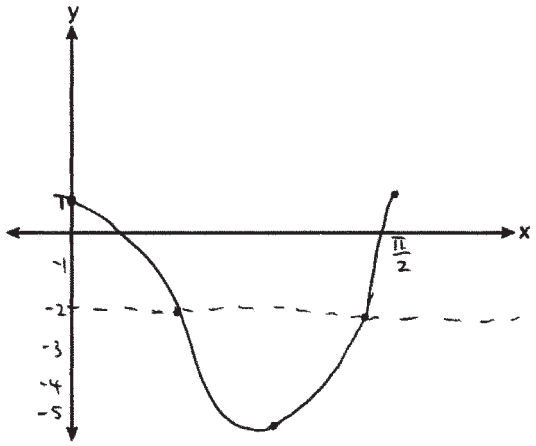
$$\frac{-5 \pm \sqrt{5^2 - 4(1)(6)}}{2(3)}$$

$$\frac{-5 \pm \sqrt{-71}}{6}$$

Score 0: The student did not simplify the radical and did not express the answer in $a + bi$ form.

Question 28

28 On the coordinate plane below, sketch *at least one cycle* of a cosine function with a midline at $y = -2$, an amplitude of 3, and a period of $\frac{\pi}{2}$.

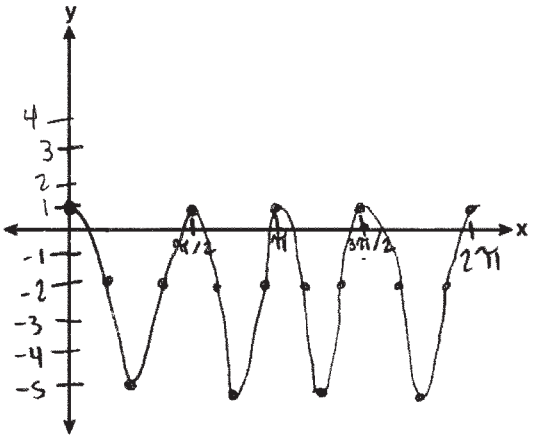


Score 2: The student gave a complete and correct response.

Question 28

28 On the coordinate plane below, sketch *at least one cycle* of a cosine function with a midline at $y = -2$, an amplitude of 3, and a period of $\frac{\pi}{2}$.

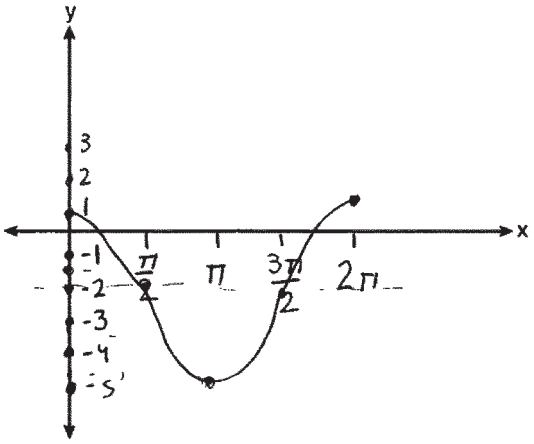
$y = 3\cos 4x - 2$



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

Question 28

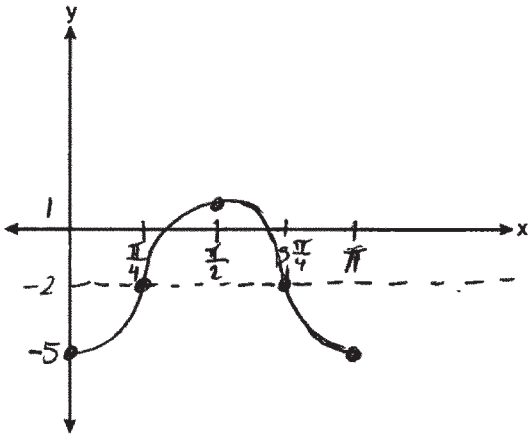
28 On the coordinate plane below, sketch *at least one cycle* of a cosine function with a midline at $y = -2$, an amplitude of 3, and a period of $\frac{\pi}{2}$.



Score 1: The student used an incorrect period.

Question 28

28 On the coordinate plane below, sketch *at least one cycle* of a cosine function with a midline at $y = -2$, an amplitude of 3, and a period of $\frac{\pi}{2}$.



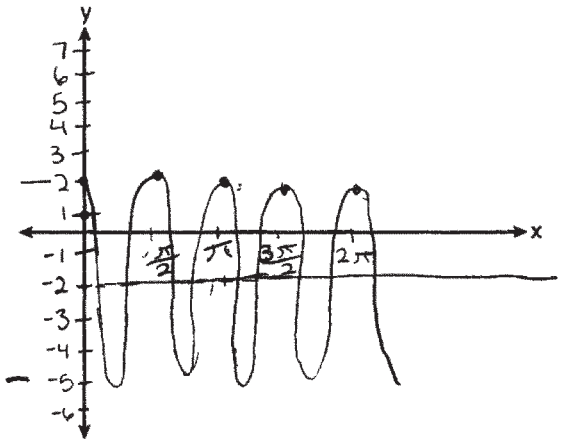
Score 1: The student graphed an acceptable negative cosine function, but has an incorrect period.

Question 28

28 On the coordinate plane below, sketch *at least one cycle* of a cosine function with a midline at $y = -2$, an amplitude of 3, and a period of $\frac{\pi}{2}$.

Starts at max

how long it takes to make one wave

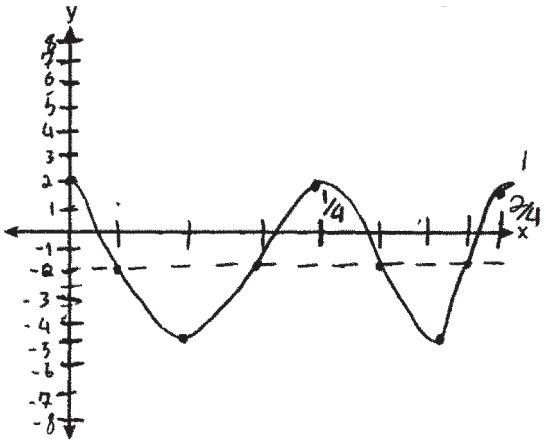


Score 1: The student graphed an incorrect maximum value.

Question 28

28 On the coordinate plane below, sketch *at least one cycle* of a cosine function with a midline at $y = -2$, an amplitude of 3, and a period of $\frac{\pi}{2}$.

$\frac{\frac{\pi}{2}}{2\pi} = \frac{1}{4}$



Score 0: The student graphed an incorrect maximum value and an incorrect period.

Question 29

29 Given i is the imaginary unit, simplify $(5xi^3 - 4i)^2$ as a polynomial in standard form.

$(5xi^3-4i)(5xi^3-4i)$

$25x^2i^6 - 40xi^4 + 16i^2$

$-25x^2 - 40x - 16$

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

Question 29

29 Given i is the imaginary unit, simplify $(5xi^3 - 4i)^2$ as a polynomial in standard form.

$(5xi^3 - 4i)^2$

$(5xi^3 - 4i)(5xi^3 - 4i)$

$25x^2(i^6) - 20xi^4 - 20xi^4 + 16i^2$

$i^2 = -1$

$i^2 \cdot i^2 \cdot i^2$

$-1 \cdot -1 \cdot -1$

$1 \cdot -1$

-1

$i^2 \cdot i^2$

$-1 \cdot -1$

1

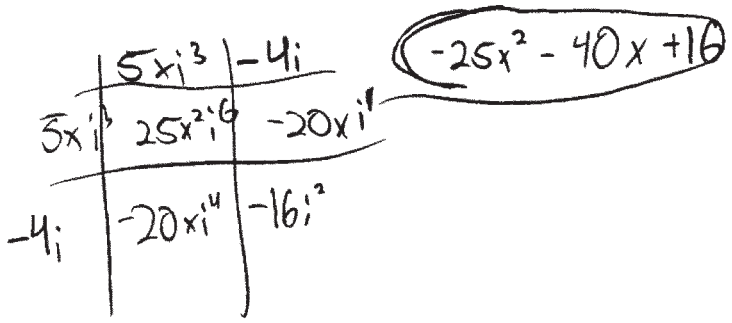
$-25x^2 - 20x - 20x - 16$

$-25x^2 - 40x - 16$

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

Question 29

29 Given i is the imaginary unit, simplify $(5xi^3 - 4i)^2$ as a polynomial in standard form.



Score 1: The student made one computational error.

Question 29

29 Given i is the imaginary unit, simplify $(5xi^3 - 4i)^2$ as a polynomial in standard form.

$(5xi^3 - 4i)(5xi^3 - 4i)$

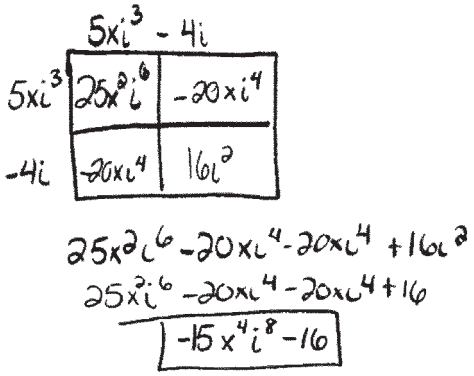
$25x^2i^6 - 25xi^4 - 25xi^4 + 16i^2$

$-25x^2 - 50x - 16$

Score 1: The student made one computational error.

Question 29

29 Given i is the imaginary unit, simplify $(5xi^3 - 4i)^2$ as a polynomial in standard form.



Score 0: The student made multiple computational errors.

Question 29

29 Given i is the imaginary unit, simplify $(5xi^3 - 4i)^2$ as a polynomial in standard form.

$25x^2(-1) - 16(-1)$

$-25x^2 + 16$

$-9x^2$

$(x-3)(x+3)$

Score 0: The student made multiple errors.

Question 30

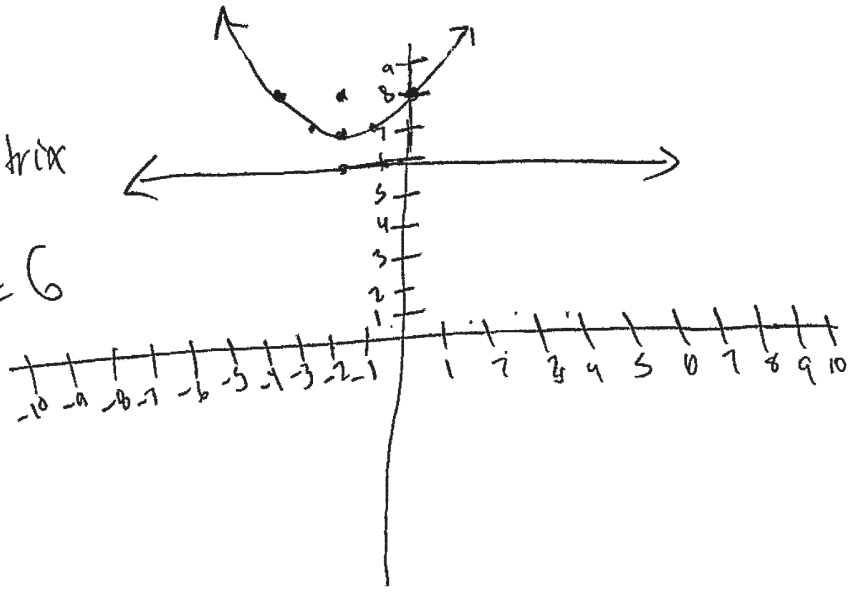
30 Consider the parabola given by $y = \frac{1}{4}x^2 + x + 8$ with vertex $(-2,7)$ and focus $(-2,8)$. Use this information to explain how to determine the equation of the directrix.

To determine the equation of the directrix, you would graph the parabola and the focus. Then find the distance from the vertex to the focus and the directrix is equal distance from the vertex in the opposite direction.

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

Question 30

30 Consider the parabola given by $y = \frac{1}{4}x^2 + x + 8$ with vertex $(-2,7)$ and focus $(-2,8)$. Use this information to explain how to determine the equation of the directrix.



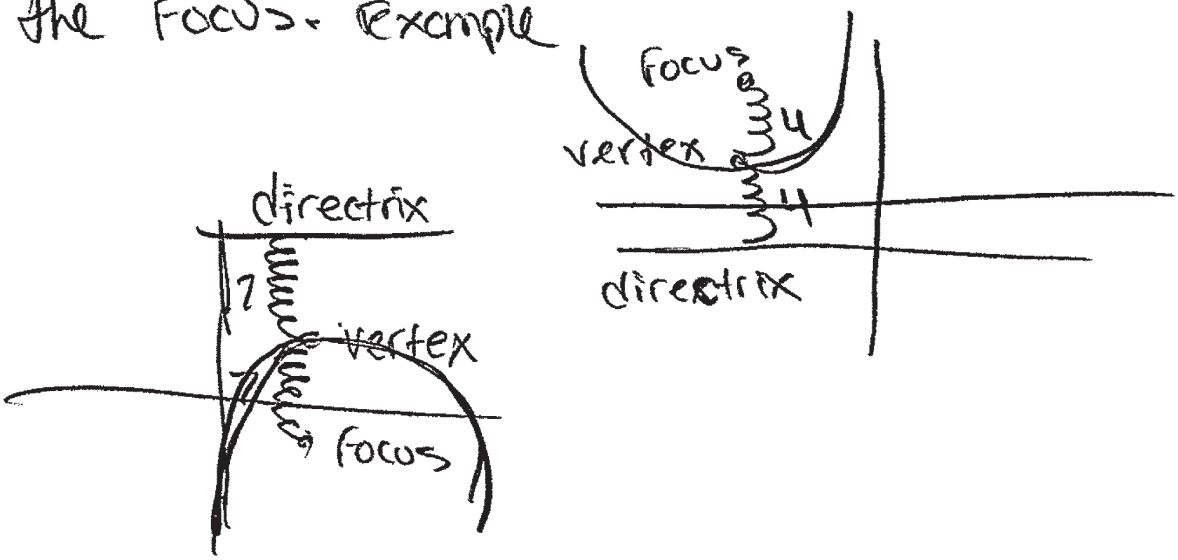
I found directrix by graping the the parabola and plotting the vertex and focus. The I found the space between vertex and focus and went in opposite direction to find the directrix. Distance between vertex and focus is same as the distance between vertex and directrix.

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

Question 30

30 Consider the parabola given by $y = \frac{1}{4}x^2 + x + 8$ with vertex $(-2,7)$ and focus $(-2,8)$. Use this information to explain how to determine the equation of the directrix.

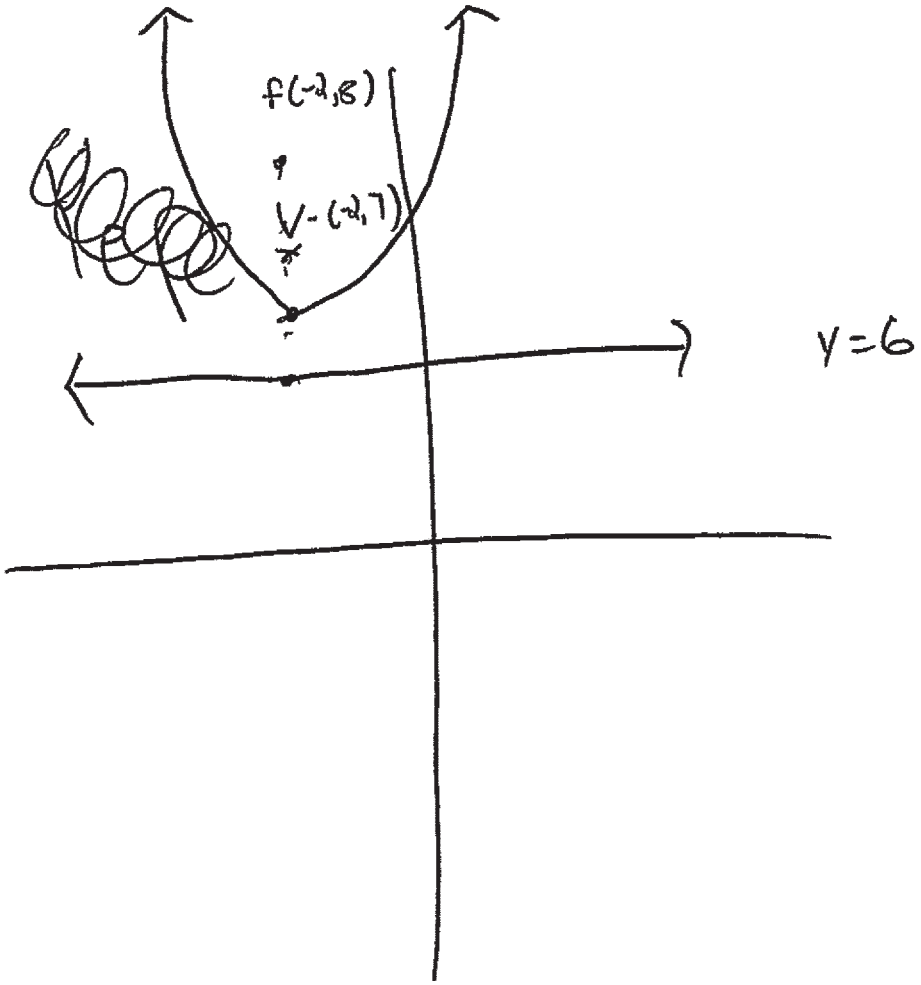
First you plot the vertex and the focus. when that is done you count how many spaces away they are from eachother then you count away from the focus. Example



Score 1: The student wrote an incomplete explanation.

Question 30

30 Consider the parabola given by $y = \frac{1}{4}x^2 + x + 8$ with vertex $(-2,7)$ and focus $(-2,8)$. Use this information to explain how to determine the equation of the directrix.



Score 1: The student wrote a correct equation of the directrix, but gave no explanation.

Question 30

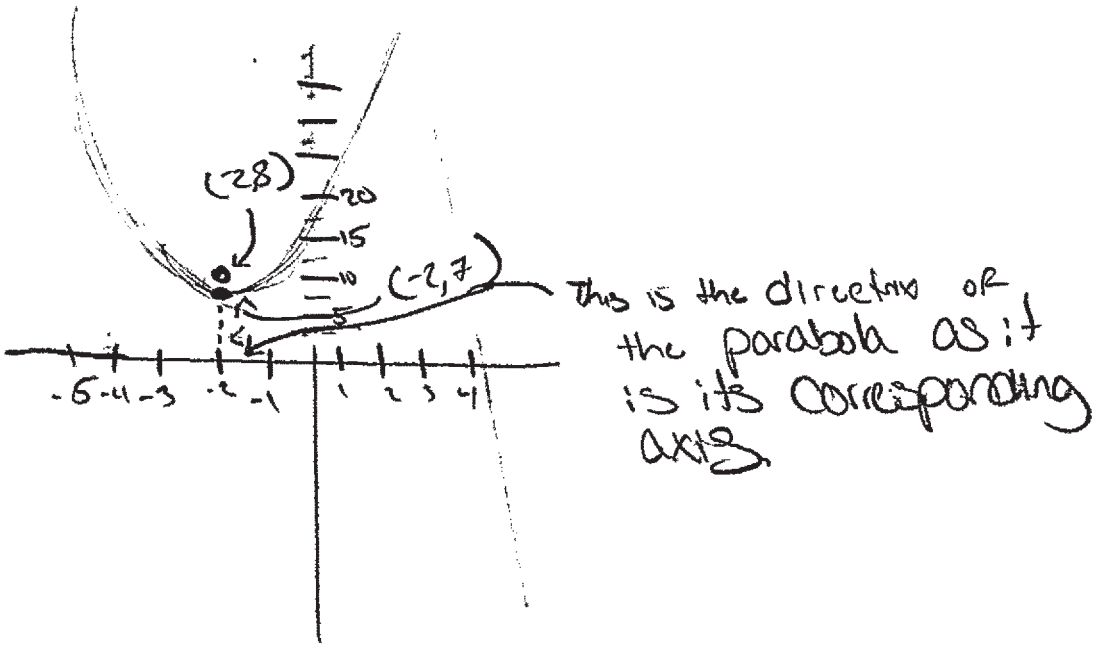
30 Consider the parabola given by $y = \frac{1}{4}x^2 + x + 8$ with vertex $(-2,7)$ and focus $(-2,8)$. Use this information to explain how to determine the equation of the directrix.

directrix : $y = 6$

Score 0: The student did not write an explanation and showed no work to find $y = 6$.

Question 30

30 Consider the parabola given by $y = \frac{1}{4}x^2 + x + 8$ with vertex $(-2,7)$ and focus $(-2,8)$. Use this information to explain how to determine the equation of the directrix.



Score 0: The student wrote an incorrect explanation.

Question 31

31 Write $\frac{x\sqrt{x^3}}{\sqrt[3]{x^5}}$ as a single term in simplest form, with a rational exponent.

$x(x^3)^{\frac{1}{2}}$

$\frac{x \cdot x^{\frac{3}{2}}}{(x^5)^{\frac{1}{3}}} = \frac{x^{\frac{5}{2}}}{x^{\frac{5}{3}}}$

$x^{\frac{5}{6}}$

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

Question 31

31 Write $\frac{x\sqrt{x^3}}{\sqrt[3]{x^5}}$ as a single term in simplest form, with a rational exponent.

$x\sqrt{x^3} = x\left(x^{\frac{3}{2}}\right) = x^{\frac{5}{2}}$

$\frac{15}{6} - \frac{10}{6} = \frac{5}{6}$

$\sqrt[3]{x^5} = x^{\frac{5}{3}}$

$\frac{x^{\frac{5}{2}}}{x^{\frac{5}{3}}} = x^{\left(\frac{5}{2} - \frac{5}{3}\right)}$

$x^{\frac{5}{6}}$

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

Question 31

31 Write $\frac{x\sqrt{x^3}}{\sqrt[3]{x^5}}$ as a single term in simplest form, with a rational exponent.

$\frac{x(x^3)^2}{(x^3)^5}$ $\frac{x(x^6)}{x^{15}} = \frac{x^7}{x^{15}} = x^{7-15} = x^{-8} = \frac{1}{x^8}$

Score 1: The student made an error converting from radical form to rational exponents, but then followed through correctly.

Question 31

31 Write $\frac{x\sqrt{x^3}}{\sqrt[3]{x^5}}$ as a single term in simplest form, with a rational exponent.

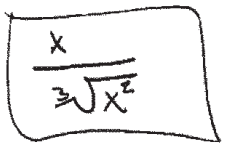
$$\frac{x\left(x^{\frac{3}{2}}\right)}{x^{\frac{5}{3}}} = \frac{x^{\frac{5}{2}}}{x^{\frac{5}{3}}} = x^{\frac{5}{2}} \cdot x^{\frac{3}{5}} = x^{\frac{31}{10}}$$

Score 1: The student made an error dividing.

Question 31

31 Write $\frac{x\sqrt{x^3}}{\sqrt[3]{x^5}}$ as a single term in simplest form, with a rational exponent.

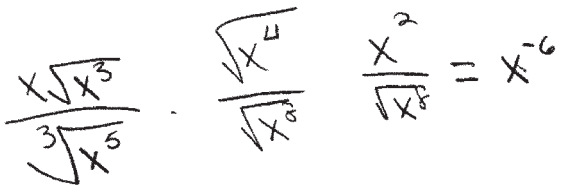
7



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

Question 31

31 Write $\frac{x\sqrt{x^3}}{\sqrt[3]{x^5}}$ as a single term in simplest form, with a rational exponent.



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

Question 32

32 A fruit fly population can be modeled by the equation $P = 10(1.27)^t$, where P represents the number of fruit flies after t days. What is the average rate of change of the population, rounded to the *nearest hundredth*, over the interval [0,10.5]? Include appropriate units in your answer.

t	P(t)
0	10
10.5	123.01

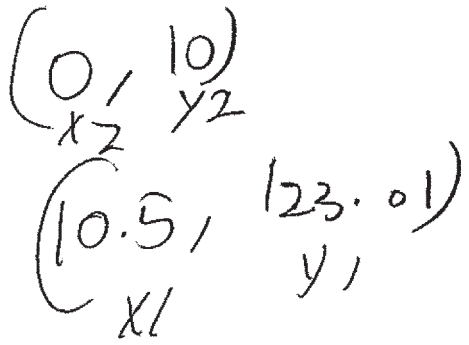
$$\frac{123.01 - 10}{10.5 - 0} = 10.76$$

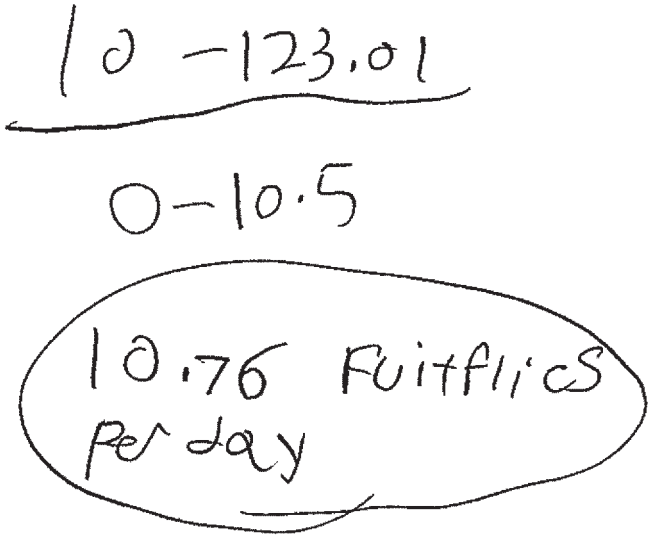
The average rate of change in the population over the interval [0,10.5] is 10.76 fruit flies per day.

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

Question 32

32 A fruit fly population can be modeled by the equation $P = 10(1.27)^t$, where P represents the number of fruit flies after t days. What is the average rate of change of the population, rounded to the *nearest hundredth*, over the interval [0,10.5]? Include appropriate units in your answer.





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

Question 32

32 A fruit fly population can be modeled by the equation $P = 10(1.27)^t$, where P represents the number of fruit flies after t days. What is the average rate of change of the population, rounded to the *nearest hundredth*, over the interval [0,10.5]? Include appropriate units in your answer.

$P = 10(1.27)^0$

$P = 10$

$P = 10(1.27)^{10.5}$

$P = 123.0096181$

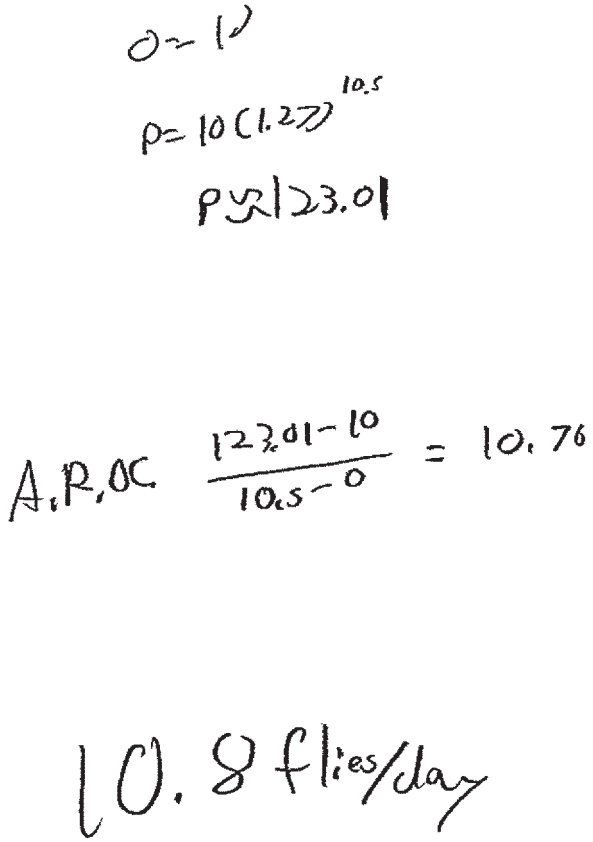
$\frac{\Delta y}{\Delta x}$ $\frac{123.0096181 - 10}{10.5 - 0}$ $\frac{113.0096181}{10.5} = 10.76282$

average rate of change = 10.76

Score 1: The student did not include units.

Question 32

32 A fruit fly population can be modeled by the equation $P = 10(1.27)^t$, where P represents the number of fruit flies after t days. What is the average rate of change of the population, rounded to the *nearest hundredth*, over the interval [0,10.5]? Include appropriate units in your answer.



Score 1: The student made a rounding error.

Question 32

32 A fruit fly population can be modeled by the equation $P = 10(1.27)^t$, where P represents the number of fruit flies after t days. What is the average rate of change of the population, rounded to the *nearest hundredth*, over the interval [0,10.5]? Include appropriate units in your answer.

(0, 10) (10.5, 123.01)

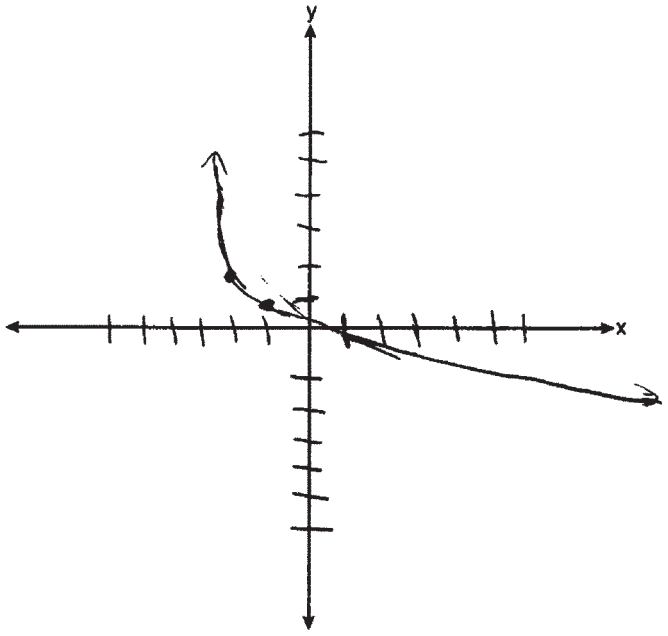
$\frac{x_2 - x_1}{y_2 - y_1} = \frac{10.5 - 0}{123.01 - 10}$

$\frac{10.5}{113.01} = .09$ increase per day

Score 0: The student made an error finding the average rate of change and did not include correct units.

Question 33

33 Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.



Describe the end behavior of $p(x)$ as $x \to -3$.

As $x \to -3$
$y \to \infty$

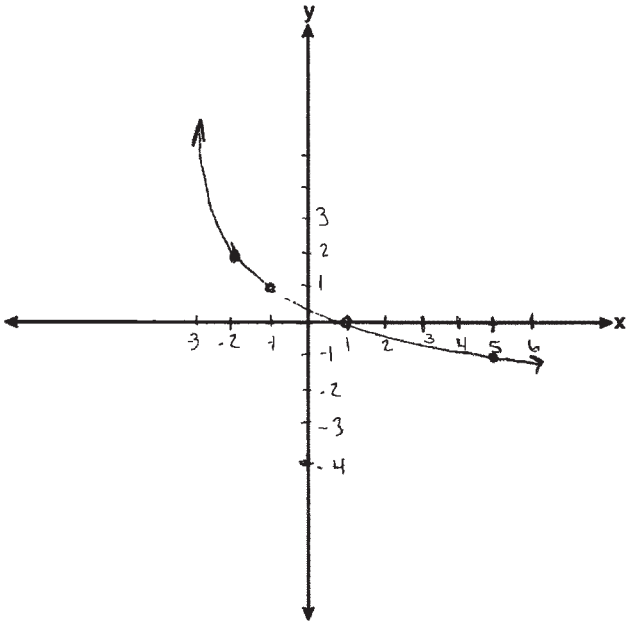
Describe the end behavior of $p(x)$ as $x \to \infty$.

As $x \to \infty$
$y \to -\infty$

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

Question 33

33 Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.



Describe the end behavior of $p(x)$ as $x \to -3$.

As x approaches -3, p(x) increases infinitely

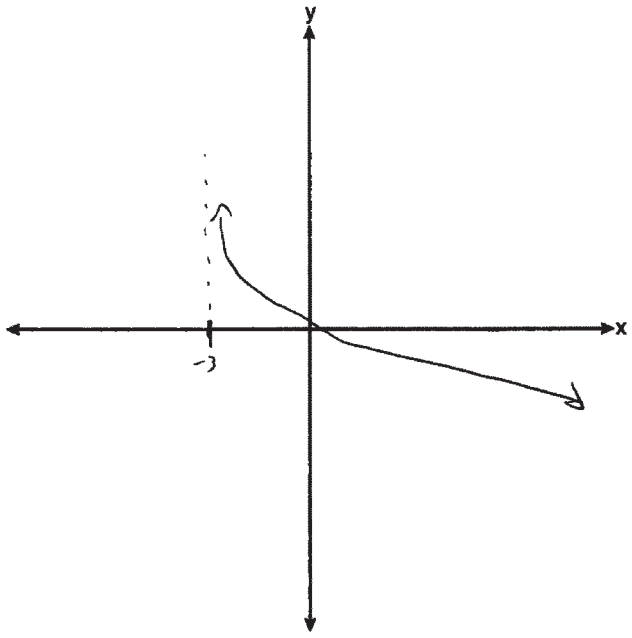
Describe the end behavior of $p(x)$ as $x \to \infty$.

as x approaches ∞, p(x) approaches −∞

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

Question 33

33 Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.



Describe the end behavior of $p(x)$ as $x \to -3$.

as $x \to -3$, $p(x) \to$

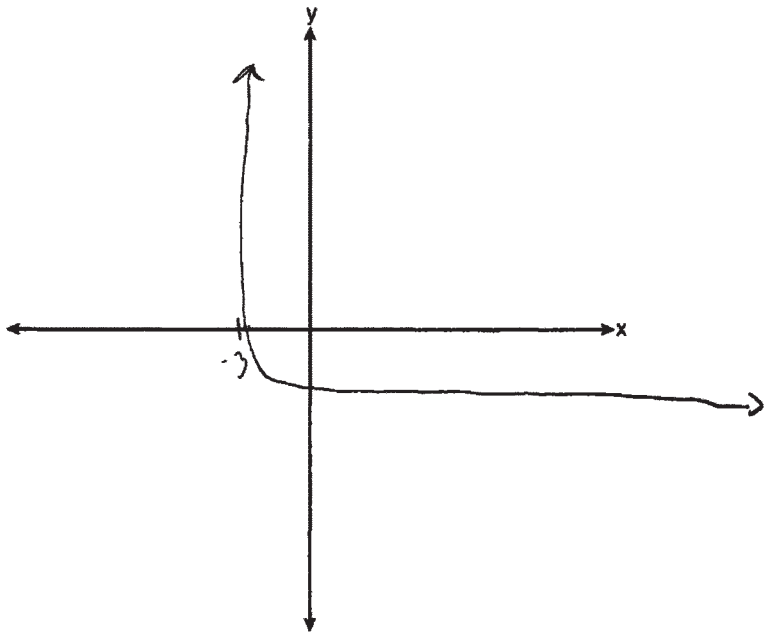
Describe the end behavior of $p(x)$ as $x \to \infty$.

as $x \to \infty$, $p(x) \to -\infty$

Score 3: The student did not state the end behavior as $x \to -3$.

Question 33

33 Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.



Describe the end behavior of $p(x)$ as $x \to -3$.

The value continues to increase.

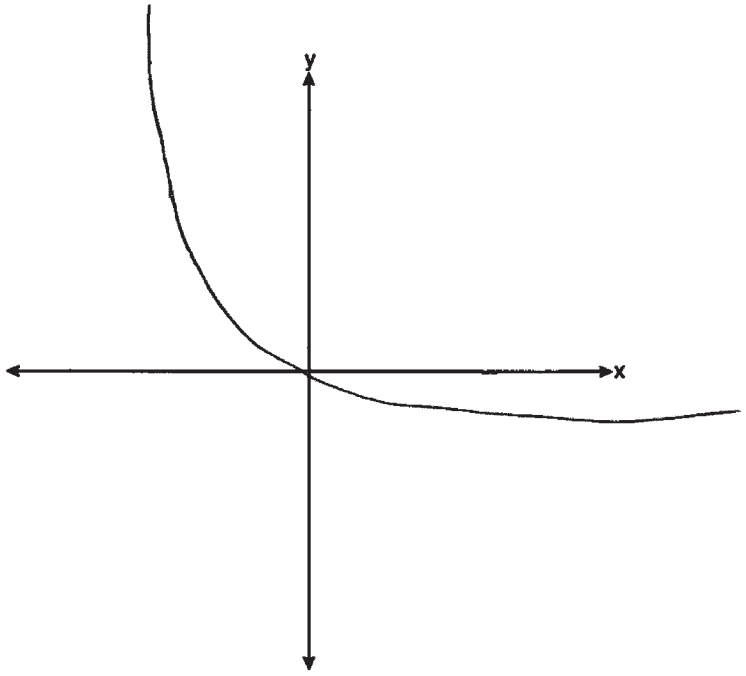
Describe the end behavior of $p(x)$ as $x \to \infty$.

The value continues to decrease

Score 3: The student made one graphing error.

Question 33

33 Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.



Describe the end behavior of $p(x)$ as $x \to -3$.

As x decreases to -3, the y-value increases

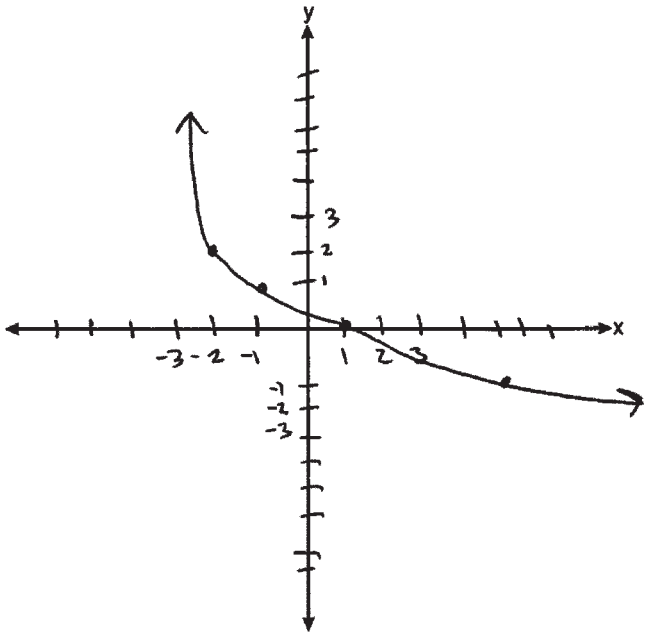
Describe the end behavior of $p(x)$ as $x \to \infty$.

As x increases to ∞, the y-value decreases

Score 2: The student only received credit for the descriptions.

Question 33

33 Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.



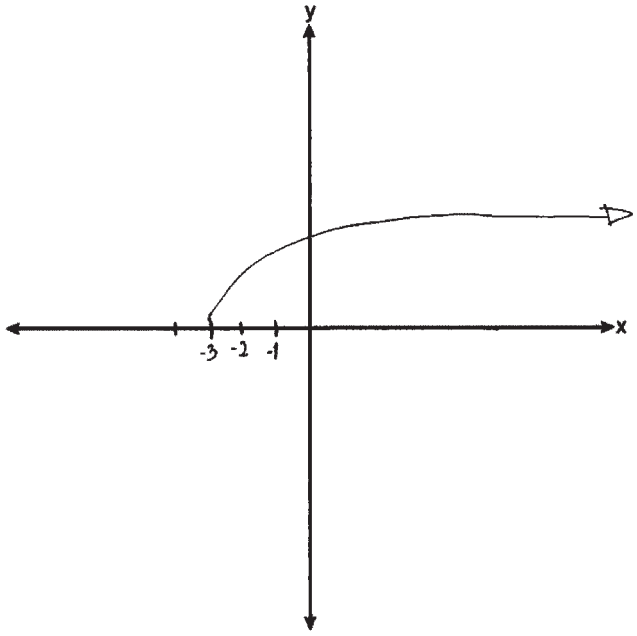
Describe the end behavior of $p(x)$ as $x \to -3$.

Describe the end behavior of $p(x)$ as $x \to \infty$.

Score 2: The student sketched a correct graph.

Question 33

33 Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.



Describe the end behavior of $p(x)$ as $x \rightarrow -3$.

the end of p(x) as x → -3 is Error this means that Graph, don't have a exactly Value.

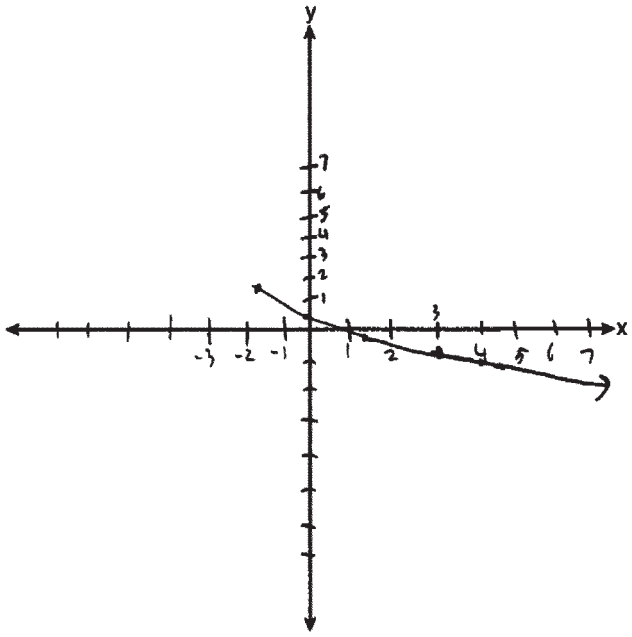
Describe the end behavior of $p(x)$ as $x \rightarrow \infty$.

the end of p(x) as x → ∞ is infinity

Score 1: The student correctly described the end behavior of the graph they sketched as $x \rightarrow \infty$.

Question 33

33 Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.



Describe the end behavior of $p(x)$ as $x \rightarrow -3$.

$[-3, \infty)$

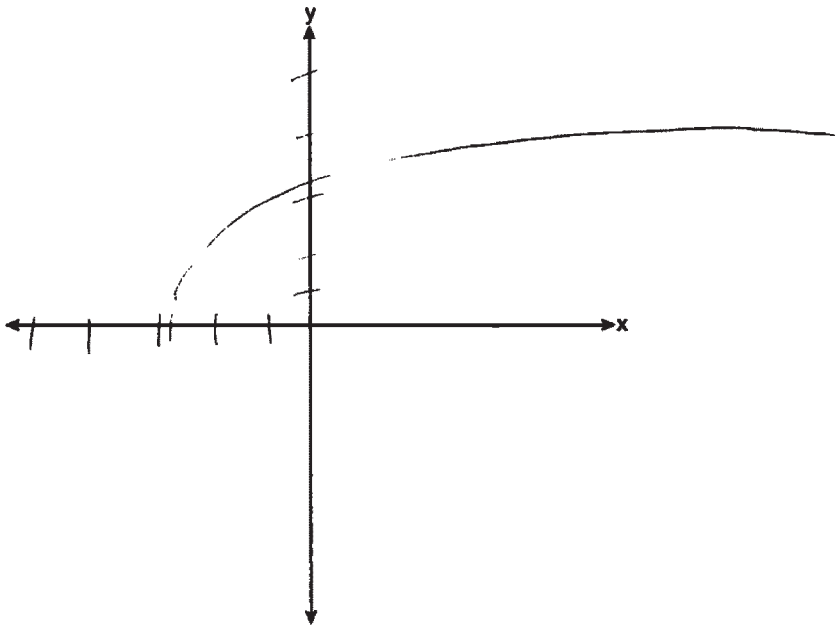
Describe the end behavior of $p(x)$ as $x \rightarrow \infty$.

$[-\infty, \infty)$

Score 1: The student made one graphing error and received no credit for the descriptions.

Question 33

33 Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.



Describe the end behavior of $p(x)$ as $x \to -3$.

It will never go past -3

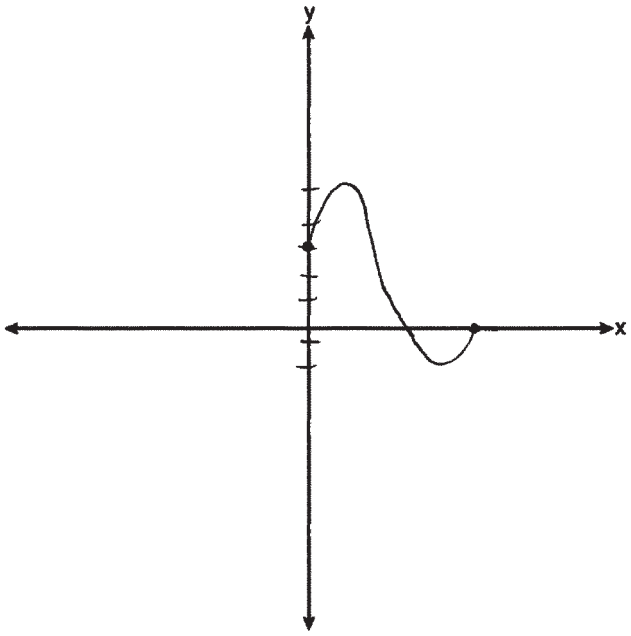
Describe the end behavior of $p(x)$ as $x \to \infty$.

It will go on forever

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

Question 33

33 Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.



Describe the end behavior of $p(x)$ as $x \to -3$.

It will be opposite
of +3

Describe the end behavior of $p(x)$ as $x \to \infty$.

It will continue
going

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

Question 34

34 Solve for x algebraically: $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12}$

$\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12}$

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

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

$x^2-5x-2 = 4$

$x^2-5x-6 = 0$

$(x-6)(x+1) = 0$

~~$x=6$~~ $x=-1$

Score 4: The student gave complete and correct response.

Question 34

34 Solve for x algebraically: $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12}$

$\frac{1}{x-6} + \frac{x}{x-2} - \frac{4}{x^2-8x+12} = 0$

$\frac{1}{x-6} + \frac{x}{x-2} - \frac{4}{x^2-2x-6x+12} = 0$

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

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

$\frac{x-2+x(x-6)-4}{(x-2)(x-6)} = \frac{-5x-6+x^2}{(x-2)(x-6)} = 0$

$\frac{x^2+x-6x-6}{(x-2)(x-6)} = 0$

$\frac{(x+1)(x-6)}{(x-2)(x-6)} = 0$

$\frac{x+1}{x-2}$ $x+1=0$ $-1=x$

Score 4: The student gave complete and correct response.

Question 34

34 Solve for x algebraically: $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12}$

$x^2 - 8x + 12$

$(x-2)(x-6)$

$1 \cdot (x-2) + x(x-6) = 4$

$x - 2 + x^2 - 6x = 4$

$x^2 - 6x + x - 2 - 4 = 0$

$x^2 - 5x - 6 = 0$

$(x+1)(x-6) = 0$

$x = -1$ ✓

$x = 6$

$\frac{1}{-1-6} + \frac{-1}{-3} = \frac{4}{1+8+12}$

$\frac{3}{-3}\ \frac{1}{-7} + \frac{1}{3} = \frac{4}{21}$

$\frac{-3}{21} + \frac{7}{21} = \frac{4}{21}$

$\frac{4}{21} = \frac{4}{21}$

$\frac{1}{6-6} = \frac{1}{0}$ x reject

$\boxed{-1}$

Score 4: The student gave complete and correct response.

Question 34

34 Solve for x algebraically: $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12}$

$\frac{1}{x-6} \cdot \frac{x}{x-2} = \frac{4}{x^2-8x+12}$

$\frac{x-2+x^2-6x}{(x-6)(x-2)} = \frac{4}{x^2-8x+12}$

$\frac{x^2-5x-2}{(x-6)(x-2)} = \frac{4}{(x-6)(x-2)}$

$x^2-5x-2 = 4$

$-4 \quad -4$

$x^2-5x-6=0$

$(x-6)(x+1)=0$

$x=6$
$x=-1$

Score 3: The student failed to reject $x = 6$.

Question 34

34 Solve for x algebraically: $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12}$

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

$(x-2)+x(x-6) = 4$

$x^2-6x+x-2 = 4$

$x^2-5x-6 = 0$

$(x-6)(x+1) = 0$

$x = 6, 1$

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

Question 34

34 Solve for x algebraically: $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12}$

$\frac{(x-2)}{(x-2)(x-6)} + \frac{x(x-6)}{(x-6)(x-2)} = \frac{4}{(x-6)(x-2)}$

$(x-2) + x(x-6) = 4$

$(x-2) + x^2 - 6x = 4$

$+2 \qquad +2$

$x + x^2 - 6x = 6$

$\frac{x^3}{x^3} - 6x = 6 - x^3$

$-6 \quad -6$

$x = 1 - x^3$

Score 1: The student gave a correct equation cleared of fractions.

Question 34

34 Solve for x algebraically: $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12}$

$\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12}$

$(x-6)(x-2)$

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

$1 + x = 4$

$-1 \quad -1$

$x = 3$

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

Question 34

34 Solve for x algebraically: $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12}$

$(x-2)(x-6)$

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

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

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

$(x-6)+\frac{x(x-6)}{(x-2)(x-6)}=4$

$(x-6)+\frac{x}{(x-2)}\cdot\frac{(x-2)}{1}=4(x-2)$

$x-6+x=4x-8$

$2x-6=4x-8$

$-2x \quad -2x$

$-6=2x-8$

$+8 \quad +8$

$\frac{2}{2}=\frac{2x}{2}$ $\boxed{x=1}$

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

Question 35

35 Solve the following system of equations algebraically for x, y, and z.

$$2x + 4y - 3z = 12$$
$$3x - 2y + 2z = -9$$
$$-x + y - 3z = 0$$

$+x \qquad +x$

$y - 3z = x$

$3(y - 3z) - 2y + 2z = -9$

$3y - 9z - 2y + 2z$

$y - 7z = -9$

$+7z \quad +7z$

$y = 7z - 9$

$2((2z - 9) - 3z) + 4(7z - 9) - 3z = 12$

$14z - 18 - 6z + 28z - 36 - 3z = 12$

$33z - 54 = 12$

$+54 \quad +54$

$\frac{33z}{33} = \frac{66}{33}$

$z = 2$

$y = 7(2) - 9$

$y = 5$

$-x + 5 - 3(2) = 0$

$-x - 1 = 6$

$+1 \quad +1$

$\frac{-x}{-1} = \frac{1}{-1}$

$x = -1$

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

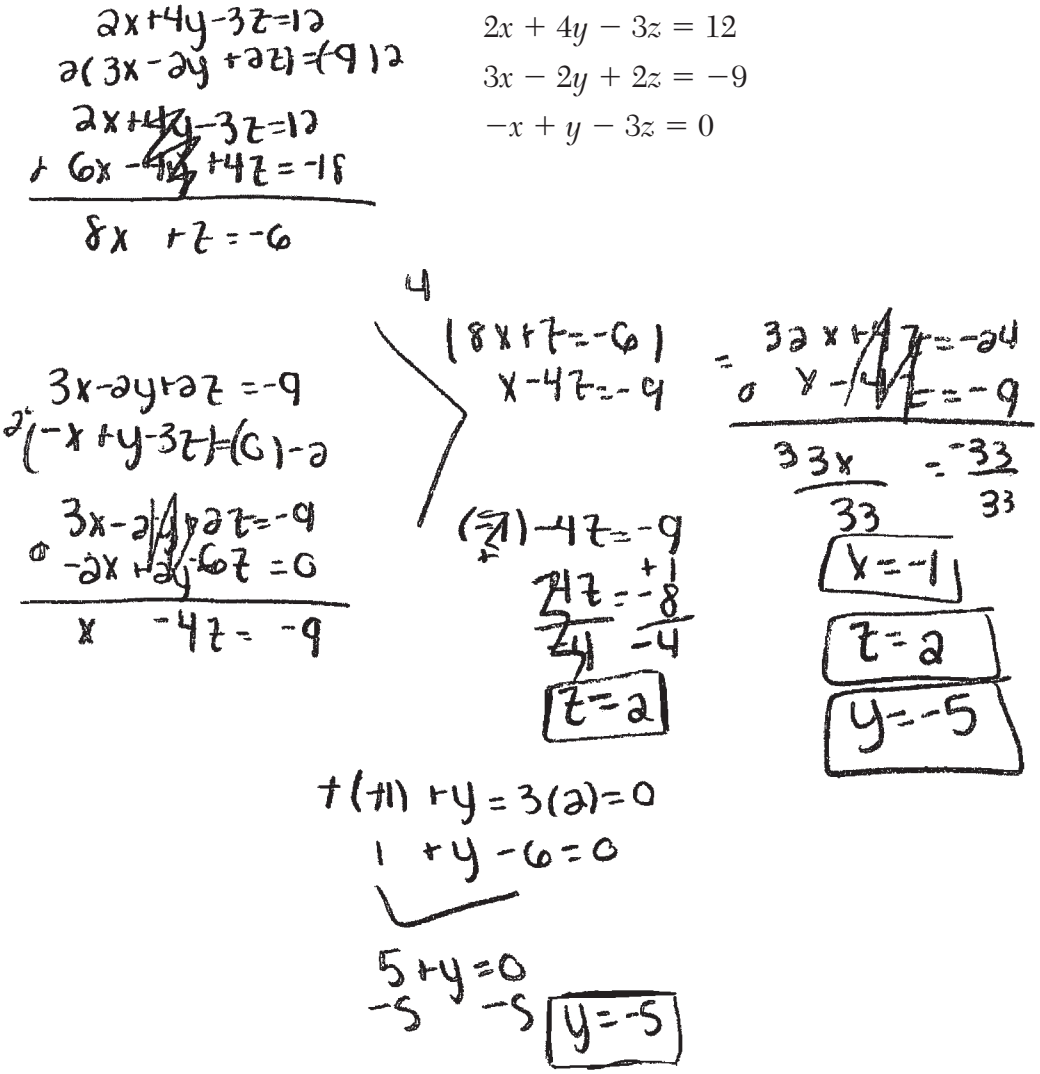
Question 35

35 Solve the following system of equations algebraically for x, y, and z.

$2x + 4y - 3z = 12$

$3x - 2y + 2z = -9$

$-x + y - 3z = 0$



Score 3: The student made one computational error when solving for y.

Question 35

35 Solve the following system of equations algebraically for x, y, and z.

$$\begin{aligned} &2x + 4y - 3z = 12 \\ &3x - 2y + 2z = -9 \\ &-x + y - 3z = 0 \end{aligned}$$

① $2x + 4y - 3z = 12$

② $2(3x - 2y + 2z = -9)$

$8x + z = -6$

$8(-.5) + z = -9$

$-4 + z = -9$

$+4 \quad +4$

$z = -5$

② $3x + 2y + 2z = -9$

③ $2(x + y - 3z = 0)$

$-x - 4z = -9$

$2(.5) + 4y - 3(-5) = 12$

$1 + 4y + 15 = 12$

$4(8x + z = -6)$

$-x - 4z = -9$

$\frac{30x}{30} = \frac{-15}{30}$

$x = -.5$

$4y + 14 = 12$

$+14 \quad +14$

$\frac{4y = 26}{4 \quad 4}$

$y = 6.5$

Score 2: The student made multiple computational errors.

Question 35

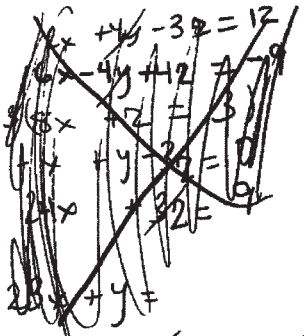
35 Solve the following system of equations algebraically for x, y, and z.

$$2x + 4y - 3z = 12$$
$$3x - 2y + 2z = -9$$
$$-x + y - 3z = 0$$

X = -1

y =

z =



$2x + 4y - 3z = 12$

$3x - 2y + 2z = -9$

$2(-x + y - 3z = 0)$

$-2x + 2y - 6z = 0$

$3x - 2y + 2z = -9$

$x - 4z = -9$

$2x + 4y - 3z = 12$

$6x - 4y + 4z = -18$

$4(8x + 2 = -6)$

$x - 4z = -9$

$32x + 4z = -24$

$\frac{33x}{33} = \frac{-33}{33} = -1$

Score 2: The student correctly found $x = -1$.

Question 35

35 Solve the following system of equations algebraically for x, y, and z.

$$2x + 4y - 3z = 12$$
$$3x - 2y + 2z = -9$$
$$-x + y - 3z = 0$$

rref([A])

$$\begin{bmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 2 \end{bmatrix}$$

$x = -1$
$y = 5$
$z = 2$

$2(-1) + 4(5) - 3(2) = 12$
$-2 + 20 - 6 = 12$
$12 = 12$ ✓

Score 2: The student used a method other than algebraic.

Question 35

35 Solve the following system of equations algebraically for x, y, and z.

$$2x + 4y - 3z = 12$$
$$3x - 2y + 2z = -9$$
$$-4(-x + y - 3z = 0)$$

$2x+4y-3z=12$
$6x-4y+4z=-18$

$8x+2=-6$

$2x+4y-3z=12$
$4x-4y+12z=0$

$6x+9z=12$
$a(8x+2=-6)$
$6x+9z=12$
$-72x-9z=-63$

$\frac{-66x}{-66} = \frac{-51}{-66}$

$x=.773$

8C

$z=-12.184$

$2(.773)+4y-3(-12.184)=12$

$1.544+4y+36.552=12$

no answer

Score 1: The student wrote a correct system in two variables.

Question 35

35 Solve the following system of equations algebraically for x, y, and z.

$$2x + 4y - 3z = 12$$
$$3x - 2y + 2z = -9$$
$$-x + y - 3z = 0$$

$2x+4y-3z=12$
$6x-4y+4z=-18$
$8x+z=-6$

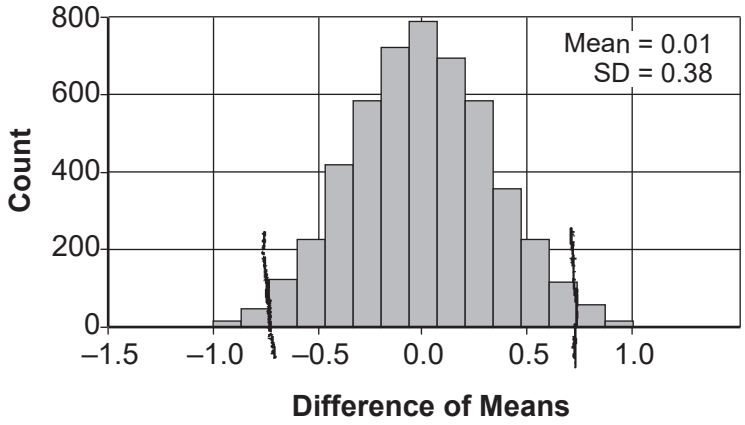
$3x-2y+2z=-9$
$-2x+2y-6z=0$
$5x+8z=-9$
$8x+z=-6$
$(9x-3z=-15)\cdot(-1)$
$-9x+3z=15$
$-x+y-3z=0$
$y=15$

$x=2$ $y=8$ $z=2$

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

Question 36

36 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*.

$\bar{X} \pm 2\sigma$

$0.01 \pm 2(0.38)$

$0.01 \pm .76$

$[-.75, .77]$

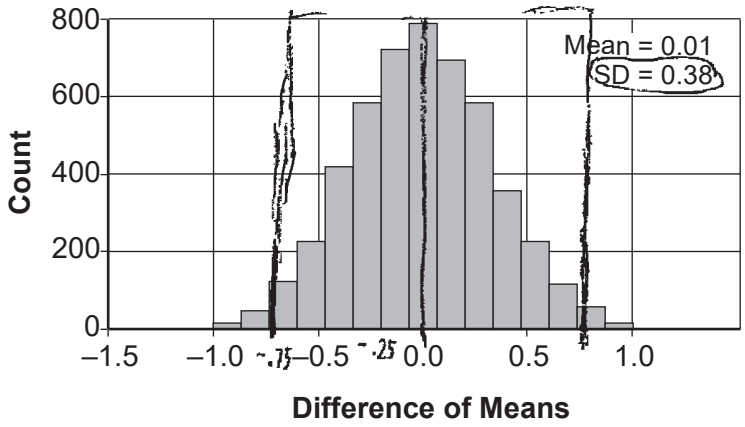
Does the interval indicate that the difference between the classes' grades is significant? Explain.

"0.6" is within the interval so it is usual, so its not significant

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

Question 36

36 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*.

0.01 + 0.76 = 0.77
0.01 − 0.76 = −0.75

−0.75 to 0.77

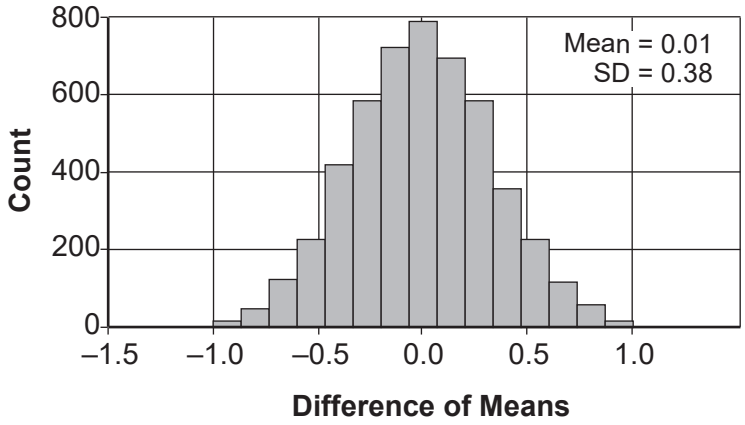
Does the interval indicate that the difference between the classes' grades is significant? Explain.

No, its usual because 0.6 is in the 95% C.I. of −.75 to .77.

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

Question 36

36 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*.

-.75 -.77

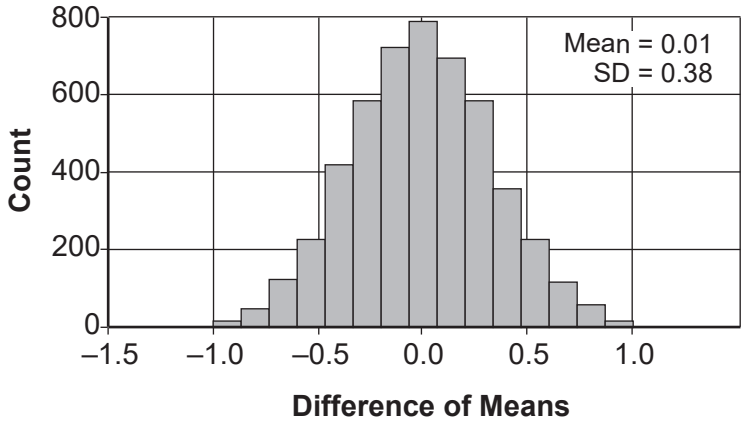
Does the interval indicate that the difference between the classes' grades is significant? Explain.

No, because .6 is within two standard deviations.

Score 3: The student did not show work to find the interval.

Question 36

36 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*.

95% = within 2 SDs

.01 + .38 + .38

.01 - .38 - .38

(-.8, .8)

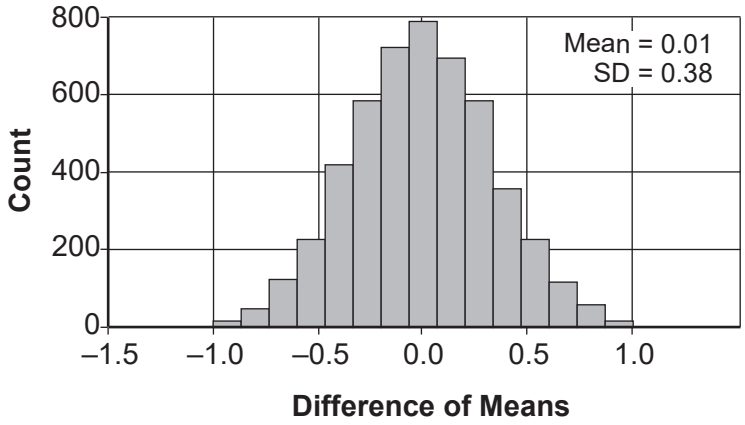
Does the interval indicate that the difference between the classes' grades is significant? Explain.

The difference between class grades is not significant, as .6 fall in the interval which contains 95% of the data

Score 3: The student made a rounding error.

Question 36

36 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*.

$\bar{x} \pm MOE$

$.01 \pm 2(.38)$

$.01 \pm .76$

$.01 - .76$ $\quad$ $.01 + .76$

$(-.75, .77)$

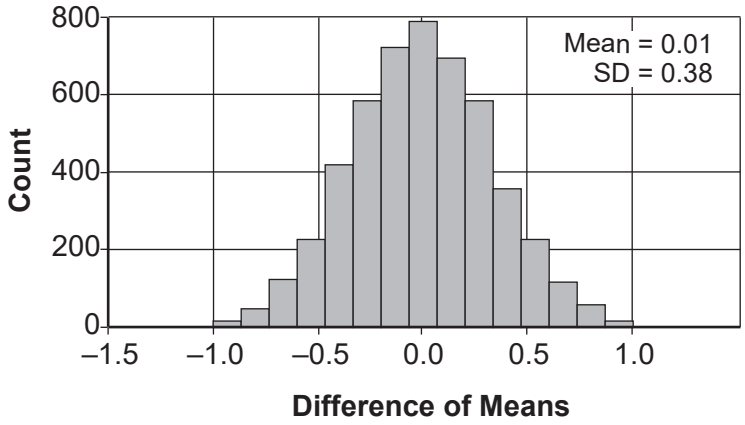
Does the interval indicate that the difference between the classes' grades is significant? Explain.

The difference of .6 lies within the interval therefore it is significant

Score 2: The student only received credit for the correct interval.

Question 36

36 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*.

MOE=
CI = $\bar{x} \pm 2\sigma$
CI = 0.01 ± 2(.38)
+ → 0.77
− → −0.75
[−0.75, 0.77]

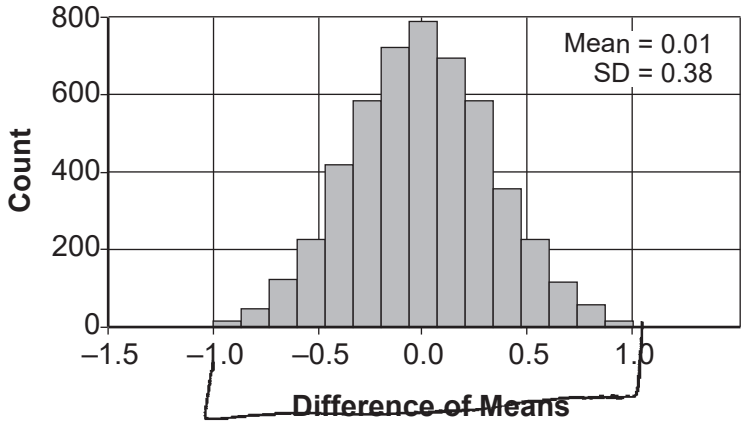
Does the interval indicate that the difference between the classes' grades is significant? Explain.

The interval includes that the difference between the classes is not significant because the difference is not less than 0.05.

Score 2: The student only received credit for the correct interval.

Question 36

36 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*.

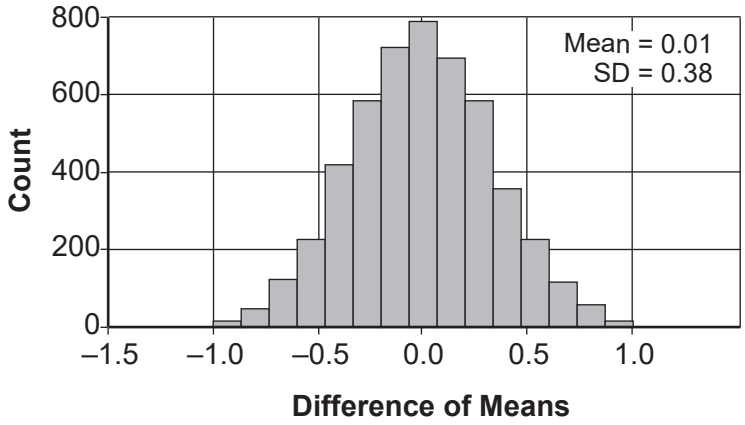
Does the interval indicate that the difference between the classes' grades is significant? Explain.

yes because the data changes.

Score 1: The student received one credit for the first part.

Question 36

36 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*.

20

(.77, .75)

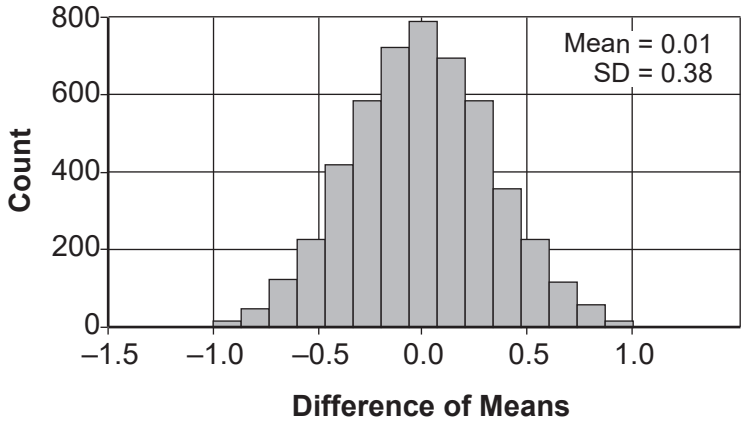
Does the interval indicate that the difference between the classes' grades is significant? Explain.

No, because the interval is very small which means the grades were very close together.

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

Question 36

36 Two classes of students were entered into an experiment to see whether using an interactive whiteboard leads to better grades. It was observed that the mean grade of students in the class with the interactive whiteboard was 0.6 points higher than the class without it. To determine if the observed difference is statistically significant, the classes were rerandomized 5000 times to study these random differences in the mean grades. The output of the simulation is summarized in the histogram below.



what

Determine an interval containing the middle 95% of the simulation results. Round your answer to the *nearest hundredth*.

u=.01
σ=.38

−.8 to .8

Does the interval indicate that the difference between the classes' grades is significant? Explain.

No because 95% of the data lies between ±.8 points in a grade difference.

Score 0: The student did not show enough correct work to receive any credit. A negative response was indicated, but the explanation was incorrect.

Question 37

37 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested $8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.

$A(t) = 8000\left(1+\frac{.042}{4}\right)^{4t}$

$B(t) = 8000e^{.039t}$

Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.

AGby
6 y
$828.63

$8000\left(1+\frac{.042}{4}\right)^{4(18)} = 11970.89992$

$8000e^{.039(18)} = -16142.27394$

Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

$\frac{\ln 3}{.039} = \frac{.039t}{.039}$ the

$24000 = 8000e^{.039t}$

$3 = e^{.039t}$

$t = 28.2$

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

Question 37

37 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested $8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.

$A(t) = 8000\left(1+\frac{0.042}{4}\right)^{4t}$

$B(t) = 8000e^{0.039(t)}$

Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.

$A(18) = 8000(1.0105)^{4(18)} = 16970.90$ (Abby)

$B(18) = 8000e^{0.039(18)} = 16142.27$

$\$828.63$

Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

$\$24000$

$24000 = 8000e^{0.039(t)}$

$\ln(3) = \ln e^{0.039(t)}$

$\ln(3) = 0.039(t)$

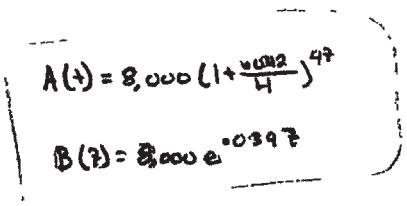
$t = \frac{\ln(3)}{0.039} = 28.2$ years

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

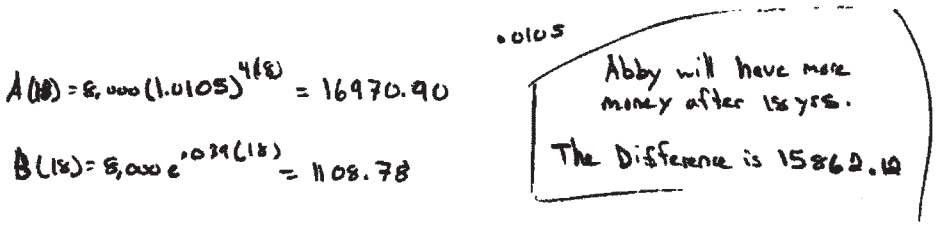
Question 37

37 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested $8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

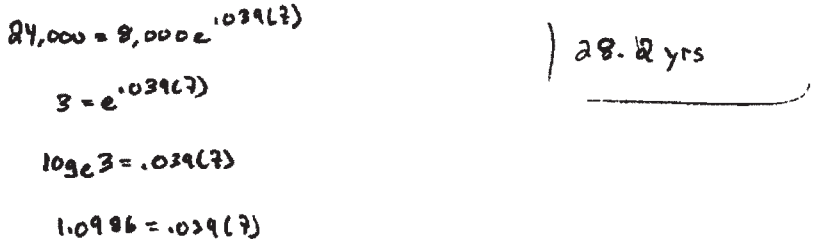
Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.



Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.



Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.



Score 5: The student made a computational error in finding $B(18)$.

Question 37

37 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested $8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.

Abby

$A(t) = 8000(1+\frac{.042}{4})^{4t}$

$B(t) = 8000e^{.039t}$

Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.

$A(t) = 16970.90$ Abby will

$B(t) = 16142.27$

Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

$\frac{24000}{8000} = \frac{8000e^{.039t}}{8000}$

$\ln 3 = \ln e^{.039t}$

28 years

Score 4: The student failed to determine the difference between accounts and made a rounding error in the third part.

Question 37

37 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested $8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.

$A(t) = 8000(1 + .042/4)^{4t}$

$B(t) = 8000e^{.039t}$

Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.

$A(18) = 8000(1.0105)^{4(18)}$

$= 16970.90$

$B(18) = 8000e^{.039(18)}$

$= 16142.27$

Abby will have more.

$828.63 difference

$$\begin{array}{r} 16970.90 \\ -\ 16142.27 \\ \hline 828.63 \end{array}$$

Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

Score 4: The student earned credit for the first two parts.

Question 37

37 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested $8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.

$A(t) = 8000\left(1 + \frac{.042}{4}\right)^{4t}$

$B(t) = 8,000e^{.039t}$

Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.

$A(t) = 8000\left(1 + \frac{.042}{4}\right)^{4(18)} = \$14,970.90$

$B(t) = 8000e^{.039(18)} = \$16,192.27$

Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

$\frac{24,000 = 8,000e^{.039(x)}}{8,000}$

$6.05 = e^{.039x}$

$\frac{\ln 6.05 = .039x \ln e}{\ln e}$

$\frac{\ln 6 = .039x}{.039}$

$x = 46 \text{ yrs}$

Score 3: The student failed to determine the difference between accounts, and made two errors in the third part.

Question 37

37 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested $8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.

$A(t) = 8000(1+.042)^t$ $\quad$ $B(t) = 8000(1+.039)^t$

Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.

Abby: $8000(1+.042)^{18}$ $\quad$ $\$16776.79$

Brett: $8000(1+.039)^{18}$ $\quad$ $\$15928.31$

$\$848.48$

Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

$\frac{24000}{8000} = \frac{8000(1+.039)^t}{8000}$

$3 = 1.039^t$

$t = \log_{1.039}(3)$

$t = 28.715349947 \text{ years}$

Score 2: The student earned one point for determining the difference in the account and made one rounding error in the third part.

Question 37

37 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested $8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.

$A(t)=8000\left(1+\frac{.042}{\frac{1}{4}}\right)^{+\left(\frac{1}{4}\right)}$

$B(t)=8000\left(1+\frac{.039}{\frac{1}{4}}\right)^{+\left(\frac{1}{4}\right)}$

Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.

$A(t)=8000\left(1+\frac{.042}{4}\right)^{4(18)}=16090.99$

$B(t)=8000\left(1+\frac{.039}{\frac{1}{4}}\right)^{\frac{1}{4}(18)}=15360.32$

Abby will have more money

16090.99 − 15360.32

difference is

730.6

Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

Score 2: The student received credit only for the second part.

Question 37

37 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested $8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.

$A(t) = 8000 + (.042)^{4t}$

$B(t) = 8000(e)^{.039t}$

Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.

$A(t) = 8000 + (.042)^{4(18)} = 8019.34$

$B(t) = 8000(e)^{.039} = 16142.27$ idk thats not right

Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

Score 1: The student received credit for $B(t)$.

Question 37

37 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested $8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.

Pert

8000e^(.039(12))

12774.38

Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.

Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

Score 0: The student did not show enough correct work to satisfy the criteria for 1 credit.

Question 37

37 The Manford family started savings accounts for their twins, Abby and Brett, on the day they were born. They invested $8000 in an account for each child. Abby's account pays 4.2% annual interest compounded quarterly. Brett's account pays 3.9% annual interest compounded continuously.

Write a function, $A(t)$, for Abby's account and a function, $B(t)$, for Brett's account that calculates the value of each account after t years.

$8000 = (1+.42)^{t}$

$8000 = (1.42)^{\frac{t}{4}}$ $\quad$ $8000(1.36)^{\frac{t}{12}}$

Determine who will have more money in their account when the twins turn 18 years old, and find the difference in the amounts in the accounts to the *nearest cent*.

Abby

~~$8000 = (.958)$~~ $8000 = (1.42)^{\frac{18}{4}}$

38760

Brett

~~$8000 = (1.36)^{\frac{18}{12}}$~~

16688

Algebraically determine, to the *nearest tenth of a year*, how long it takes for Brett's account to triple in value.

84 years

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

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

Regents Examination in Algebra II – August 2023

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

(Use for the August 2023 exam only.)

Raw Score	Scale Score	Performance Level
86	**100**	5
85	**98**	5
84	**97**	5
83	**96**	5
82	**95**	5
81	**94**	5
80	**93**	5
79	**92**	5
78	**92**	5
77	**91**	5
76	**90**	5
75	**90**	5
74	**89**	5
73	**88**	5
72	**88**	5
71	**87**	5
70	**87**	5
69	**86**	5
68	**86**	5
67	**85**	5
66	**84**	4
65	**84**	4
64	**84**	4
63	**83**	4
62	**83**	4
61	**82**	4
60	**82**	4
59	**82**	4
58	**81**	4
57	**81**	4
56	**81**	4
55	**80**	4
54	**80**	4
53	**80**	4
52	**79**	4
51	**79**	4
50	**79**	4
49	**78**	4
48	**78**	4
47	**78**	4
46	**77**	3
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	**72**	3
34	**72**	3
33	**71**	3
32	**70**	3
31	**69**	3
30	**69**	3
29	**68**	3
28	**67**	3
27	**66**	3
26	**65**	3
25	**63**	2
24	**62**	2
23	**61**	2
22	**59**	2
21	**57**	2
20	**55**	2
19	**54**	1
18	**52**	1
17	**50**	1
16	**48**	1
15	**46**	1
14	**44**	1
13	**42**	1
12	**39**	1
11	**37**	1
10	**34**	1
9	**31**	1
8	**28**	1
7	**25**	1
6	**22**	1
5	**19**	1
4	**15**	1
3	**12**	1
2	**8**	1
1	**4**	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.