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

ALGEBRA II

Thursday, January 23, 2025 — 1:15 to 4:15 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 The exact value of $\sin\left(\frac{8\pi}{3}\right)$ is

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

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

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

(4) $\frac{\sqrt{3}}{2}$

2 A teacher randomly divides all of her students into two groups. She grades the homework for one group but does not grade the homework for the other group. All homework is returned to the students. She then compares test scores for each of the groups to see if grading homework has an effect on the test scores.

This method of data collection is best described as

(1) an experiment

(2) an unbiased survey

(3) a simulation

(4) an observational study

3 Which expression is equivalent to $(x - 2)^2 + 27(x - 2) - 90$?

(1) $(x + 30)(x - 3)$

(2) $(x + 28)(x - 5)$

(3) $(x - 30)(x + 3)$

(4) $(x - 2)(x + 25)(x - 90)$

Use this space for computations.

4 Given the functions $f(x) = 2x + \frac{5}{2}$ and $g(x) = \frac{3}{x}$, what are the solutions to $f(x) = g(x)$?

(1) $(0.75, 4)$ or $(-2, -1.5)$

(2) $x = 0.75$ or $x = -2$

(3) $y = -1.5$ or $y = 4$

(4) $(-2, 0.75)$

5 Given $f(x) = 2x^3 - 3x^2 - 5x - 12$ and $g(x) = x - 3$, the quotient of $\frac{f(x)}{g(x)}$ is

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

(2) $2x^3 + 3x^2 + 4x$

(3) $2x^2 - 9x + 22 - \frac{78}{x - 3}$

(4) $2x^3 - 9x^2 + 22x - 78$

6 Abby is told that each day there is a 50% chance it will rain. Which simulation can Abby perform to determine the likelihood of it raining for the next seven days?

(1) Flip a coin seven times, count how many heads, and repeat 50 times.

(2) Roll a die seven times, count how many twos, and repeat 50 times.

(3) Roll a pair of dice, count totals of seven, and repeat 50 times.

(4) Flip a coin 50 times and count how many heads.

Use this space for computations.

7 What are the solutions to $4x^2 - 7x - 2 = -10$?

(1) $-\frac{1}{4}, 2$

(2) $\frac{7}{8} \pm \frac{\sqrt{79}}{8}i$

(3) $\frac{7}{8} \pm \frac{\sqrt{241}}{8}$

(4) $\frac{7}{8} \pm \frac{\sqrt{143}}{8}i$

8 If $x - 5$ is a factor of $p(x) = ax^4 + bx^3 + cx^2 + dx + e$, then which statement must be true?

(1) $p(-5) = 0$

(2) $p(-5) \neq 0$

(3) $p(5) = 0$

(4) $p(5) \neq 0$

9 In a small city, there are 22 gas stations. The mean price for a gallon of regular gas was \$2.12 with a standard deviation of \$0.05. The distribution of the data was approximately normal. Given this information, the middle 95% of the gas stations in this small city likely charge

(1) \$1.90 to \$2.34 for a gallon of gas

(2) \$1.97 to \$2.27 for a gallon of gas

(3) \$2.02 to \$2.22 for a gallon of gas

(4) \$2.07 to \$2.17 for a gallon of gas

Use this space for computations.

10 The expression $\dfrac{4x^2 - 5}{x^2 - 1}$ is equivalent to

(1) $4 - \dfrac{1}{x^2 - 1}$

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

(3) $4 - \dfrac{9}{x^2 - 1}$

(4) $4 - \dfrac{4}{x^2 - 1}$

11 For all positive values of x, which expression is equivalent to $\sqrt{x} \bullet \sqrt[4]{x^{11}}$?

(1) $x^{\frac{19}{22}}$

(2) $x^{\frac{11}{8}}$

(3) $x^{\frac{13}{4}}$

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

12 The expression $i^2(5x - 2i)^2$ is equivalent to

(1) $-25x^2 + 20xi - 4$

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

(3) $25x^2 + 20xi + 4$

(4) $25x^2 + 4$

Use this space for computations.

13 Functions f and g are given below.

$$f(x) = \frac{7}{2}x^2 - 5x + 11$$
$$g(x) = 3x^2 - 7x + 25$$

When $2f(x)$ is subtracted from $g(x)$, the result is

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

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

(3) $4x^2 - 17x - 47$

(4) $-4x^2 - 17x + 47$

14 A manufacturer claims that the number of ounces of a beverage dispensed by one of its automatic dispensers is normally distributed with a mean of 8.0 ounces and a standard deviation of 0.04 ounces. To the *nearest tenth of a percent*, what percent of the cups filled by this company's dispenser will contain between 7.9 and 8.11 ounces?

(1) 99.5

(2) 99.4

(3) 99.1

(4) 97.6

15 What is the value of x in the solution of the system of equations below?

$$5x + 2y - z = -14$$
$$7y - z = 31$$
$$5y + 4z - 5x = -23$$

(1) -17

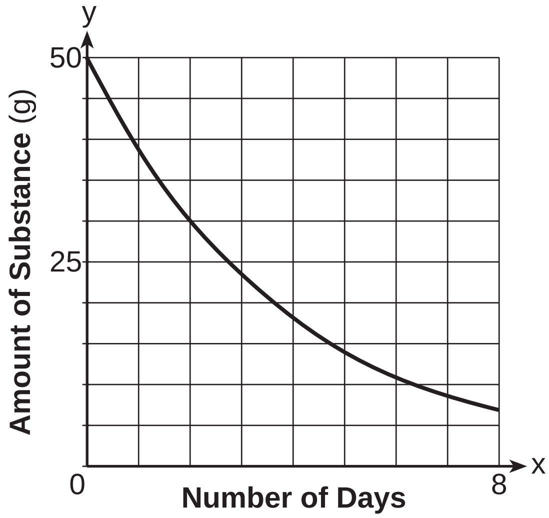
(2) 2

(3) $-\frac{1}{5}$

(4) -7

Use this space for computations.

16 The graph below shows the amount of a radioactive substance left over time.



The daily rate of decay over an 8-day interval is approximately

(1) 23%   (3) 5%

(2) 95%   (4) 77%

17 If $4\left(10^{5x-2}\right) = 12$, then x equals

(1) $\frac{2.3}{5}$ (3) $\frac{\log(3) + 2}{5}$

(2) $\frac{1}{3}\left(\frac{\log 12}{\log 40} + 5\right)$ (4) $\frac{1}{5}\left(\frac{\log 12}{\log 4} + 2\right)$

Use this space for computations.

18 A random sample of 152 students was surveyed on a particular day about how they got to school. The survey results are summarized in the table below.

		Attendance Status	
		Late	**On-Time**
Method of Transportation	**Car**	6	24
	Bus	20	80
	Walk	4	18

Which statement is best supported by the data?

(1) The probability of being late given that a student walked is greater than the probability that a student walked given that the student was late.

(2) The probability of being late given that a student walked is less than the probability that a student walked given that the student was late.

(3) The probability of being late given that a student walked is equal to the probability that a student walked given that the student was late.

(4) The probability of being late given that a student walked cannot be determined.

19 If $f(x) = \sqrt[3]{x} + 4$, then $f^{-1}(x)$ equals

(1) $\sqrt[3]{x - 4}$

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

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

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

Use this space for computations.

20 Given the equation $S(x) = 1.7\sin(bx) + 12$, where the period of $S(x)$ is 12, what is the value of b?

(1) $\frac{\pi}{6}$ (3) $\frac{\pi}{12}$

(2) 24π (4) 6π

21 Jin solved the equation $\sqrt{4 - x} = x + 8$ by squaring both sides. What extraneous solution did he find?

(1) -5 (3) 3

(2) -12 (4) 4

22 The expression $(x^2 + y^2)^2$ is *not* equivalent to

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

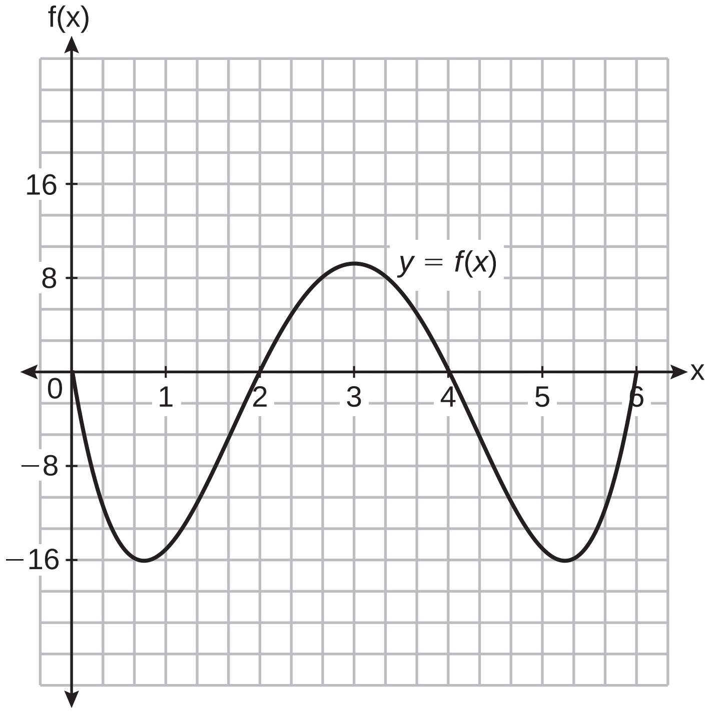
(2) $(x + y)^4 + 2(xy)^2$

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

(4) $(2x^2 + y^2)^2 - (3x^4 + 2x^2y^2)$

23 The height of a running trail is modeled by the quartic function $y = f(x)$ shown below, where x is the distance in miles from the start of the trail and y is the height in feet relative to sea level.

Use this space for computations.



If this trail has a minimum height of 16 feet below sea level, which function(s) could represent a running trail whose minimum height is half of the minimum height of the original trail?

I. $y = f\left(\frac{1}{2}x\right)$ II. $y = f(x) + 8$ III. $y = \frac{1}{2}f(x)$

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

24 The crew aboard a small fishing boat caught 350 pounds of fish on Monday. From that Monday through the end of the week on Friday, the weight of the fish caught increased 15% per day. The total weight, in pounds, of fish caught is approximately

(1) 411
(2) 612
(3) 1748
(4) 2360

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 Describe the translations that map $f(x) = \log x$ to $g(x) = \log(x + 3) - 5$.

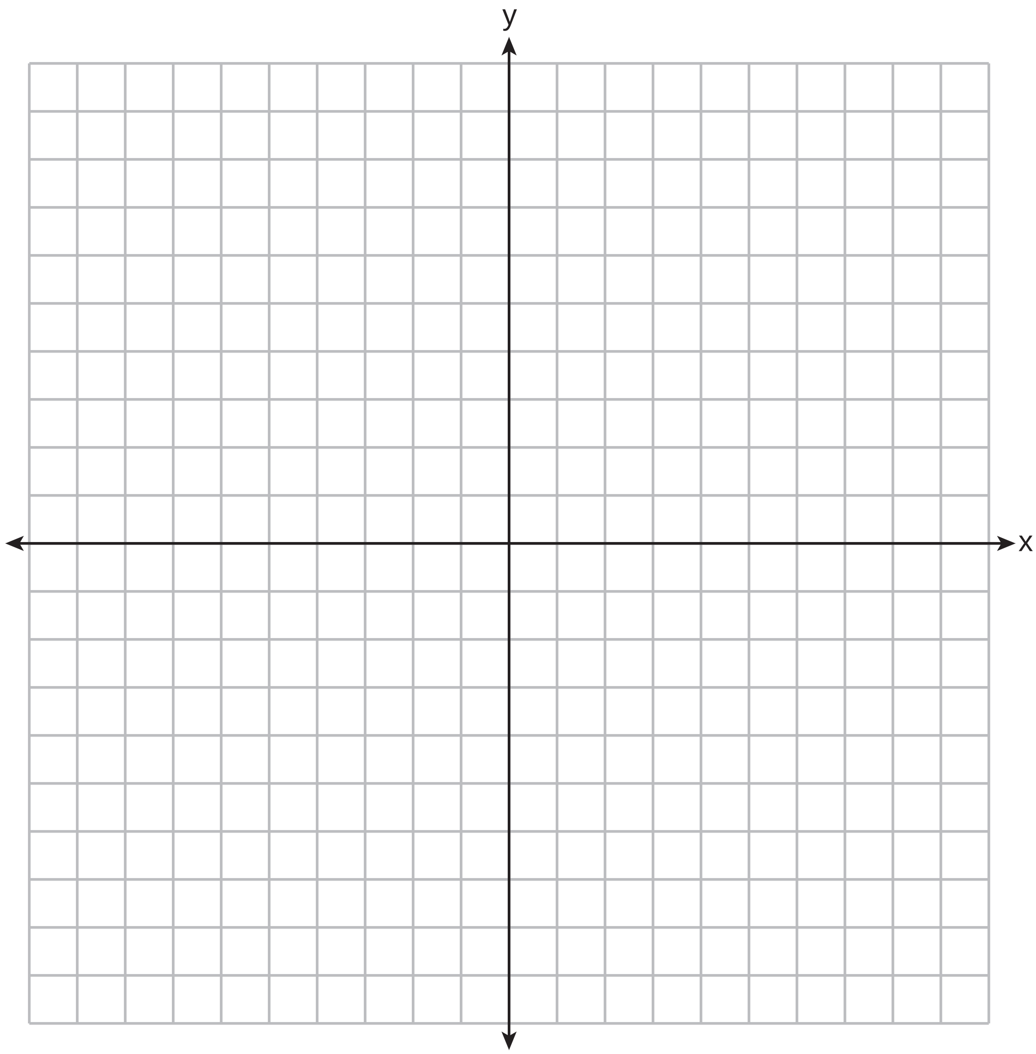
26 Solve algebraically for x: $\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$

27 Given $\cos \theta = -\frac{2}{7}$ with θ in Quadrant II, find the exact value of $\sin \theta$.

28 Given $a > 1$, use the properties of rational exponents to determine the value of x for the equation below.

$$\frac{\sqrt[5]{a^{10}}}{(a^3)^{\frac{1}{2}}} = a^x$$

29 Graph *at least one* cycle of $y = 5\sin(4x) - 3$ on the set of axes below.



30 The cost of a brand-new electric-hybrid vehicle is listed at \$33,400, and the average annual depreciation for the vehicle is 15%. The car's value can be modeled by the function $V(x) = 33{,}400(0.85)^x$, where x represents the years since purchase.

Julia and Jacob have each written a function that is equivalent to the original.

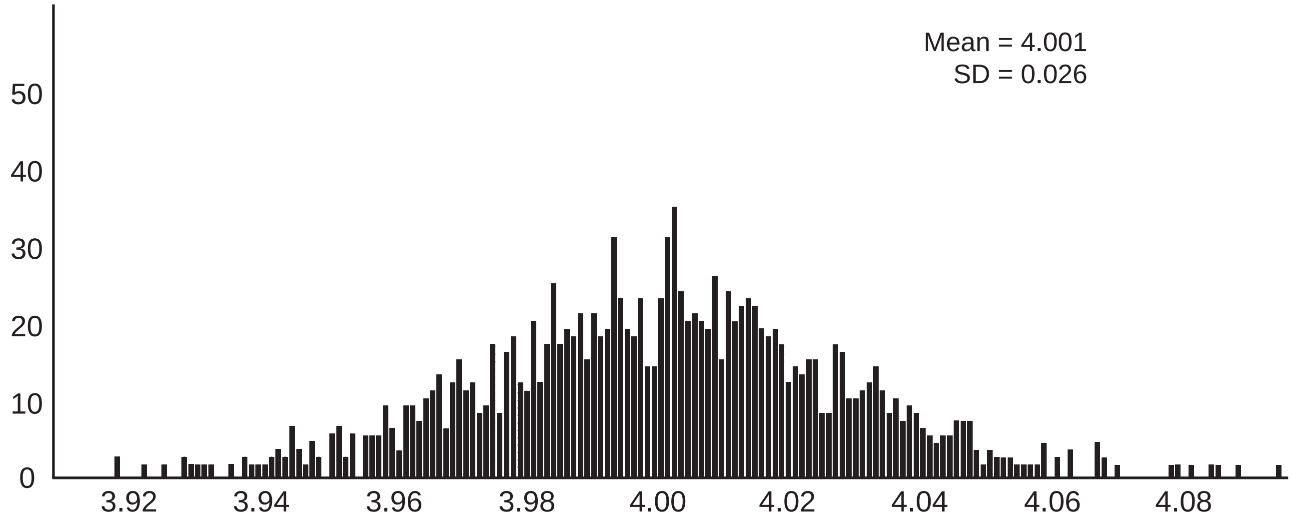
$$\text{Jacob's function: } V(x) = 33{,}400(0.1422)^{\frac{1}{12}x}$$

$$\text{Julia's function: } V(x) = 33{,}400(0.9865)^{12x}$$

Whose function is correctly rewritten to reveal the approximate monthly depreciation rate? Justify your answer.

31 Write a recursive formula for the sequence 8, 20, 50, 125, 312.5,…

32 A grocery store orders 50 bags of oranges from a company's distribution center. The bags have a mean weight of 3.85 pounds per bag. The company claims that their bags of oranges have a mean weight of 4 pounds. The grocery store ran a simulation of 50 bags, 2500 times, assuming a mean of 4 pounds. The results are shown below.



Is the mean weight of the grocery store's sample unusual? Explain using the results of the simulation.

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 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let A be the event that the guest room has a view of the lake, and let B be the event that the guest room has a queen-size bed. Events A and B are found to be independent of each other.

Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed.

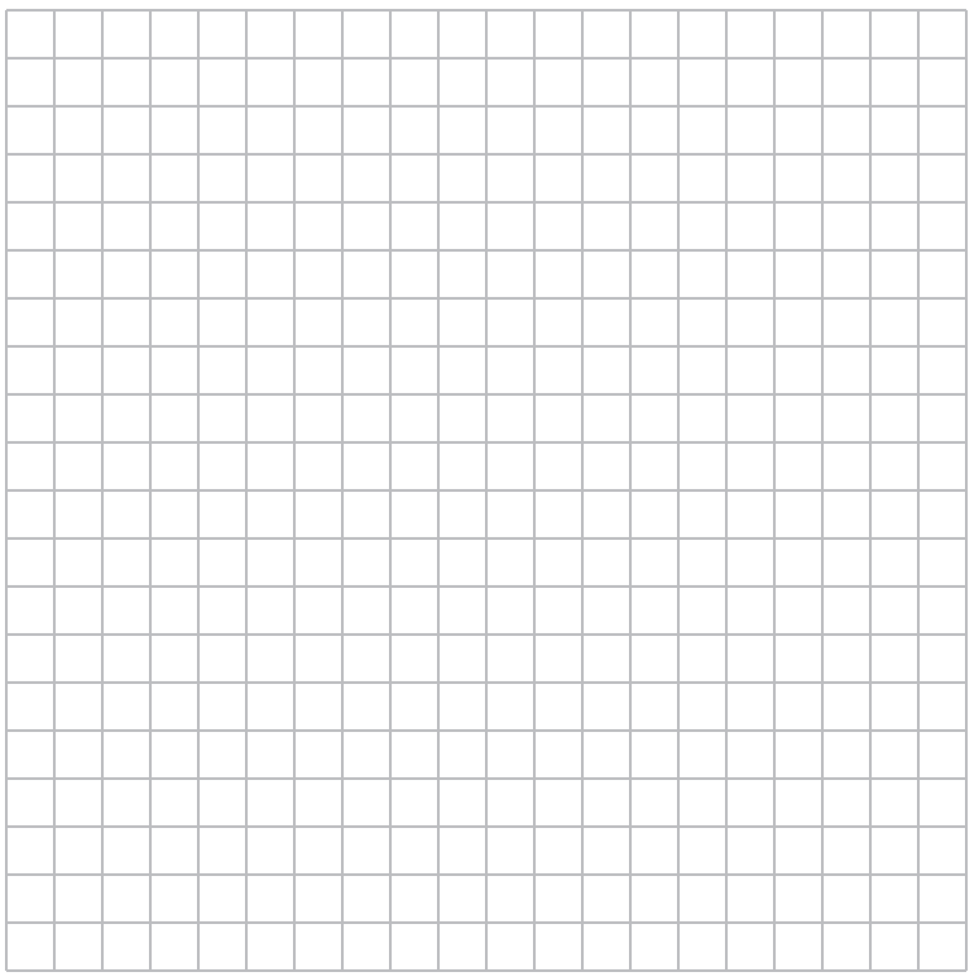
Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

34 Which function has a greater average rate of change on the interval $[-1,4]$? Justify your answer.

x	m(x)
−2	−3
−1	1
0	1
1	3
2	13
3	37
4	81
5	151

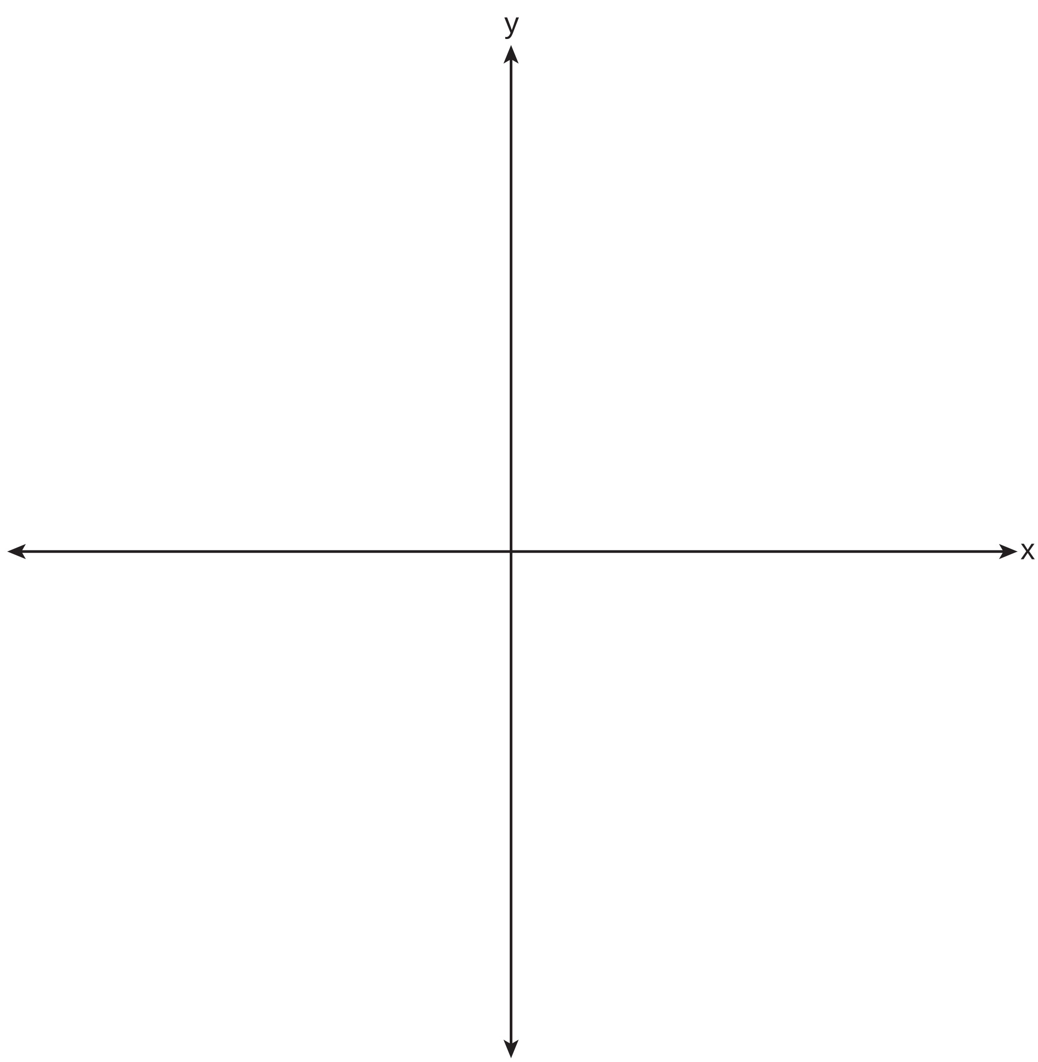
$p(x) = 3^x + 1$

35 Determine an equation for the parabola with focus $(-2, 4)$ and directrix $y = 10$. (The use of the grid below is optional.)



36 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$.

On the axes below, sketch $y = c(x)$.



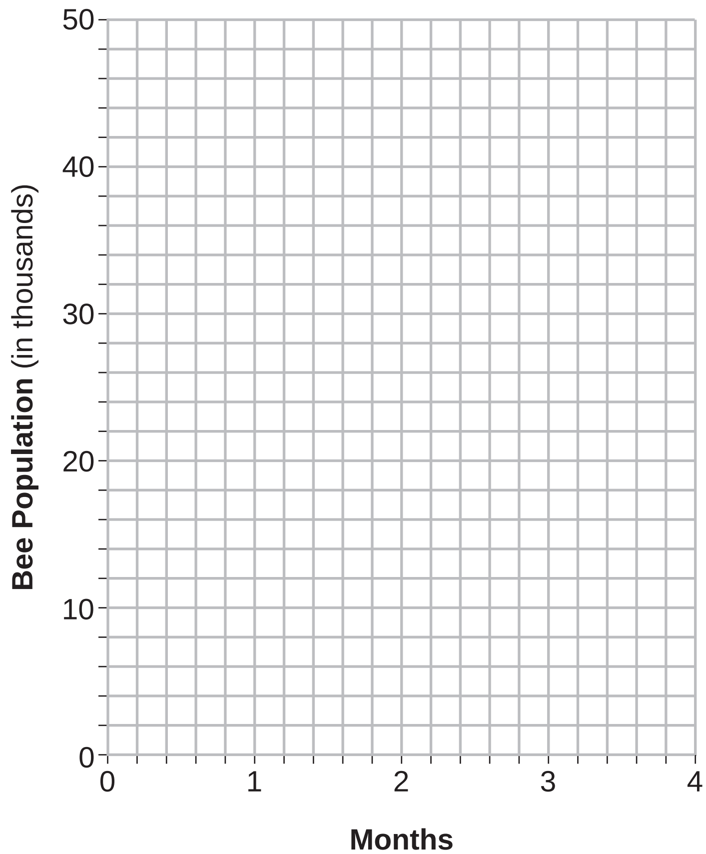
Part IV

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 populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

Graph $A(t)$ and $B(t)$ for $0 \leq t \leq 4$.



Question 37 is continued on the next page.

Question 37 continued

State, to the *nearest tenth of a month*, when the colonies will have the same population.

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony A to triple.

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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	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ 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 – January 2025

Scoring Key: Part I (Multiple-Choice Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit
Algebra II	January '25	**1**	4	MC	2
Algebra II	January '25	**2**	1	MC	2
Algebra II	January '25	**3**	2	MC	2
Algebra II	January '25	**4**	2	MC	2
Algebra II	January '25	**5**	1	MC	2
Algebra II	January '25	**6**	1	MC	2
Algebra II	January '25	**7**	2	MC	2
Algebra II	January '25	**8**	3	MC	2
Algebra II	January '25	**9**	3	MC	2
Algebra II	January '25	**10**	1	MC	2
Algebra II	January '25	**11**	3	MC	2
Algebra II	January '25	**12**	2	MC	2
Algebra II	January '25	**13**	2	MC	2
Algebra II	January '25	**14**	3	MC	2
Algebra II	January '25	**15**	4	MC	2
Algebra II	January '25	**16**	1	MC	2
Algebra II	January '25	**17**	3	MC	2
Algebra II	January '25	**18**	1	MC	2
Algebra II	January '25	**19**	2	MC	2
Algebra II	January '25	**20**	1	MC	2
Algebra II	January '25	**21**	2	MC	2
Algebra II	January '25	**22**	2	MC	2
Algebra II	January '25	**23**	4	MC	2
Algebra II	January '25	**24**	4	MC	2

Regents Examination in Algebra II – January 2025

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

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

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

The chart for determining students' final examination scores for the **January 2025 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

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REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II

Thursday, January 23, 2025 — 1:15 to 4:15 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/.

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 Thursday, January 23, 2025. 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]** Left 3 units and down 5 units or equivalent.

[1] One conceptual error is made.

or

[1] Left 3 units or down 5 units is written.

or

[1] Left and down are written.

[0] Three units and 5 units are written.

or

[0] Left or down 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.

(26) **[2]** -3, and correct algebraic work is shown.

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

or

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

or

[1] -3, but a method other than algebraic is used.

or

[1] -3, 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]** $\frac{\sqrt{45}}{7}$ 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] $\frac{\sqrt{45}}{7}$, 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]** $\frac{1}{2}$ 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] Both the numerator and denominator are correctly expressed with singular rational exponents, but no further correct work is shown.

or

[1] $\frac{1}{2}$, 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.

(29) **[2]** A correct graph is drawn.

[1] Appropriate work is shown, but one 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.

(30) **[2]** Julia is indicated, and a correct justification is given.

[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] Julia, but the justification is incomplete.

or

[1] A correct justification is given, but Julia is not indicated.

[0] Julia, but the justification is missing or incorrect.

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]** $a_1 = 8$ and $a_n = 2.5a_{n-1}$, or an equivalent recursive equation is written.

[1] One computational or notation error is made.

or

[1] One conceptual error is made.

or

[1] $a_1 = 8$ or $a_n = 2.5a_{n-1}$ is written.

[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]** A positive response is indicated and a correct explanation is written.

[1] One computational error is made.

or

[1] One conceptual error is made.

or

[1] A plausible interval containing the middle 95% of the data is correctly determined, but no further correct work is shown.

or

[1] A positive response is indicated, but the statistical evidence is incomplete.

[0] A positive response is indicated, but the explanation is missing or incorrect.

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 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]** 0.1776 and 0.8024 or equivalent, and correct work is shown.

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

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

or

[2] Appropriate work is shown to find 0.1776 or 0.8024, but no further correct work is shown.

or

[2] 0.1776 and 0.8024, but no work is shown.

[1] 0.1776 or 0.8024, 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.

(34) **[4]** p, and a correct justification is given.

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

or

[3] Appropriate work is shown to find 16 and $16.1\overline{3}$, but p is not indicated.

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

or

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

or

[2] Appropriate work is shown to find $16.1\overline{3}$, but no further correct work is shown.

or

[2] 16 and $16.1\overline{3}$, but no work is shown.

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

or

[1] 16 or $16.1\overline{3}$, but no work is shown.

[0] p, 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.

(35) **[4]** $y = \frac{-1}{12}(x + 2)^2 + 7$ or an equivalent equation, and correct work is shown.

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

or

[3] $y = \frac{1}{12}(x + 2)^2 + 7$, or equivalent, and correct work is shown.

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

or

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

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

or

[1] $y = \frac{-1}{12}(x + 2)^2 + 7$, but no work is shown.

or

[1] The vertex $(-2,7)$ is found, 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]** $-2, \pm 4$ and correct algebraic work is shown, and $c(x)$ is sketched correctly.

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

or

[3] Appropriate work is shown to find two zeros, and a correct sketch is drawn.

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

or

[2] Appropriate work is shown to find -2 and ± 4, but two or more graphing errors are made.

or

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

[1] $-2, \pm 4$, but a method other than algebraic is used, and two or more graphing errors are made.

or

[1] $-2, \pm 4$, but no work is shown, and two or more graphing errors are 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.

Part IV

For this 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]** $A(t) = 10{,}000e^{0.25t}$ and $B(t) = 6000e^{0.45t}$, correct graphs are drawn and at least one is labeled, 2.6 and 4.4, and correct work is shown.

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

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

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

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

or

[2] Appropriate work is shown to find 4.4, but no further correct work is shown.

or

[2] 2.6 and 4.4, but no work is shown.

[1] $A(t) = 10{,}000e^{0.25t}$ and $B(t) = 6000e^{0.45t}$, but no further correct work is shown.

or

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

or

[1] 2.6 or 4.4, 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.

Map to the Learning Standards
Algebra II
January 2025

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

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

The *Chart for Determining the Final Examination Score for the January 2025 Regents Examination in Algebra II* will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations on the day of the examination. 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.nysed.gov/state-assessment/teacher-feedback-state-assessments.
2. Click Regents Examinations.
3. Complete the required demographic fields.
4. Select the test title from the Regents Examination dropdown list.
5. Complete each evaluation question and provide comments in the space provided.
6. 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

Thursday, January 23, 2025 — 1:15 to 4:15 p.m., only

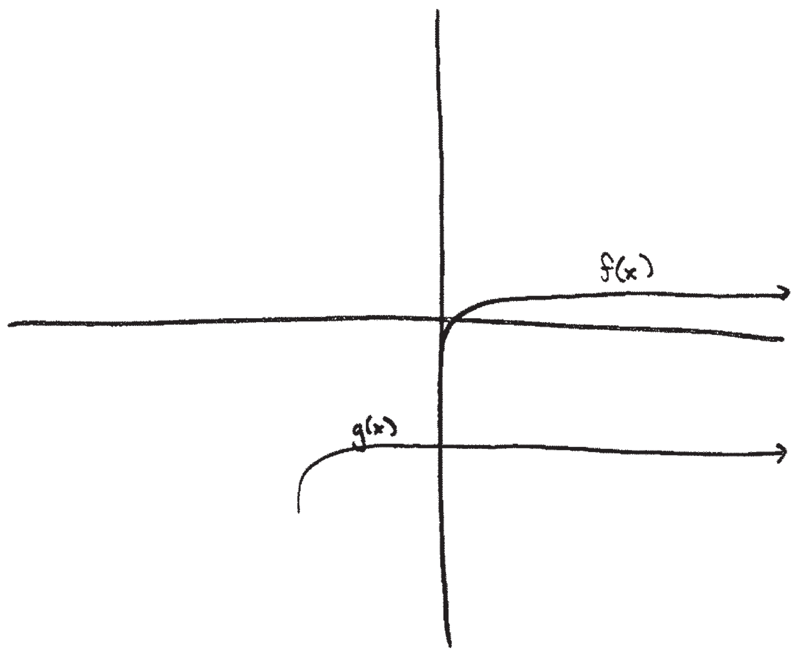
MODEL RESPONSE SET

Table of Contents

Question 25

25 Describe the translations that map $f(x) = \log x$ to $g(x) = \log(x + 3) - 5$.

The map translates 3 units to the left & 5 units down.



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

Question 25

25 Describe the translations that map $f(x) = \log x$ to $g(x) = \log(x + 3) - 5$.

$T_{(-3,-5)}$

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

Question 25

25 Describe the translations that map $f(x) = \log x$ to $g(x) = \log(x + 3) - 5$.

The graph goes 3 units right and 5 units down.

Score 1: The student incorrectly described the horizontal shift.

Question 25

25 Describe the translations that map $f(x) = \log x$ to $g(x) = \log(x + 3) - 5$.

Shift down and to the left

Score 1: The student did not include units in the description.

Question 25

25 Describe the translations that map $f(x) = \log x$ to $g(x) = \log(x + 3) - 5$.

It would tranisted up 3 units and
to the left 5 units

Score 0: The student response did not satisfy the criteria for one or more credits.

Question 25

25 Describe the translations that map $f(x) = \log x$ to $g(x) = \log(x + 3) - 5$.

log(x) moved 4.5 units down and had a vertical stretch

Score 0: The student response did not satisfy the criteria for one or more credits.

Question 26

26 Solve algebraically for x: $\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$

comon D = 6x

$$\frac{3}{3}\left(\frac{1}{2x}\right) - \left(\frac{5}{6}\right)\frac{x}{x} = \left(\frac{3}{x}\right)\frac{6}{6}$$

$$\frac{3}{6x} - \frac{5x}{6x} = \frac{18}{6x}$$

$$3 - 5x = 18$$
$$-3 \qquad -3$$

$$\frac{-5x}{-5} = \frac{15}{-5}$$

$$\boxed{x = -3}$$

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

26 Solve algebraically for x: $\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$

$$\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$$
$$-\frac{3}{x} \quad -\frac{3}{x}$$
$$\frac{1}{2x} - \frac{5}{6} - \frac{3}{x} = 0$$
$$+\frac{5}{6} \quad +\frac{5}{6}$$
$$\frac{1}{2x} - \frac{3}{x} = \frac{5}{6}$$

$$\frac{1}{2x} - \frac{3}{x} = \frac{5}{6}$$
$$2x \cdot -\frac{5}{2x} = \frac{5}{6} \cdot 2x$$
$$6 \cdot -5 = \frac{10x}{6} \cdot 6$$
$$\frac{-30}{10} = \frac{10x}{10}$$
$$\boxed{x = -3}$$

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

Question 26

26 Solve algebraically for x: $\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$

$$\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$$

$$\frac{3}{x} - \frac{1}{2x} = -\frac{5}{6}$$

$$\frac{6}{2x} - \frac{1}{2x}$$

$$\cancel{\frac{5}{2x} = -\frac{5}{6}}$$

$$10x = 30$$

$$x = 3$$

$$\boxed{-3}$$

Score 1: The student made one computational error.

Question 26

26 Solve algebraically for x: $\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$

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

$$\frac{3x}{\cancel{6x}} - \frac{5x}{\cancel{6x}} = \frac{18}{\cancel{6x}}$$

$$3x - 5x = 18$$

$$\frac{-2x}{-2} = \frac{18}{-2}$$

$$\boxed{x = -9}$$

Score 1: The student made one computational error.

Question 26

26 Solve algebraically for x: $\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$

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

$$\frac{1}{6x} - \frac{5}{6x} = \frac{3}{6x}$$

$$\frac{4}{6x} = \frac{3}{6x}$$

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

Question 26

26 Solve algebraically for x: $\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$

$$\frac{1}{2x} - \frac{5}{6} = \frac{3}{x}$$

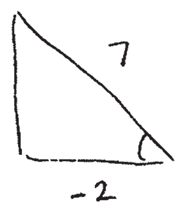
$$\frac{6}{12x} - \frac{10x}{12x} = \frac{36}{12x} \rightarrow \frac{30}{10x} \rightarrow \boxed{x = 3}$$

Score 0: The student made multiple errors.

Question 27

27 Given $\cos\theta = -\frac{2}{7}$ with θ in Quadrant II, find the exact value of $\sin\theta$.

SOH CAH TOA



$a^2 + 4 = 49$

$a^2 = 45$

$a = 3\sqrt{5}$

$\sin\theta = \frac{3\sqrt{5}}{7}$

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

Question 27

27 Given $\cos \theta = -\frac{2}{7}$ with θ in Quadrant II, find the exact value of $\sin \theta$.

$$\left(-\frac{2}{7}\right)^2 + \sin\theta^2 = 1$$

$$\frac{4}{49} + y^2 = 1$$

$$-\frac{4}{49} \qquad -\frac{4}{49}$$

$$\sqrt{y^2} = \pm\sqrt{\frac{45}{49}}$$

$$\boxed{y = \frac{\sqrt{45}}{7}}$$

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

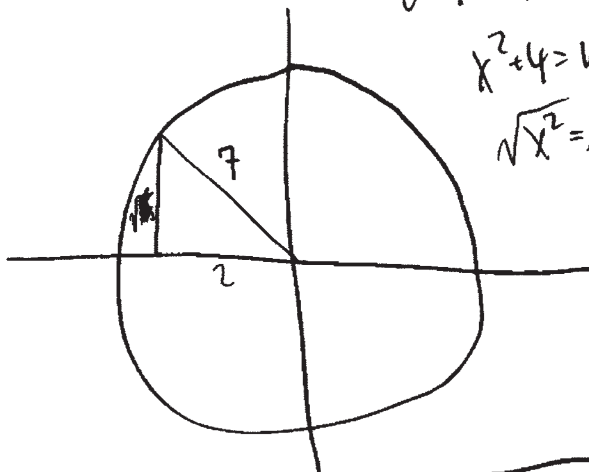
Question 27

27 Given $\cos\theta = -\frac{2}{7}$ with θ in Quadrant II, find the exact value of $\sin\theta$.

$2^2 + y^2 = 7^2$

$x^2 + 4 = 49$

$\sqrt{x^2} = \sqrt{45}$



$\boxed{\sin\theta = \frac{\sqrt{45}}{-7}}$

Score 1: The student made a sign error.

Question 27

27 Given $\cos\theta = -\frac{2}{7}$ with θ in Quadrant II, find the exact value of $\sin\theta$.

$\cos = \frac{a}{h} = \frac{-2}{7}$

$\sin = \frac{o}{h} = \frac{\sqrt{53}}{7}$

$-2^2 + x^2 = 7^2$

$-4 + x^2 = 49$

$+4 \qquad\qquad +4$

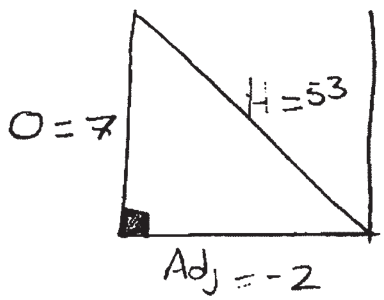
$\sqrt{x^2} = \sqrt{53}$

$x = \sqrt{53}$

Score 1: The student made a computational error.

Question 27

27 Given $\cos\theta = -\frac{2}{7}$ with θ in Quadrant II, find the exact value of $\sin\theta$.



$\cos = \frac{A}{O} = \frac{-2}{7}$

$\sin = \frac{O}{H} = \frac{7}{53}$

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

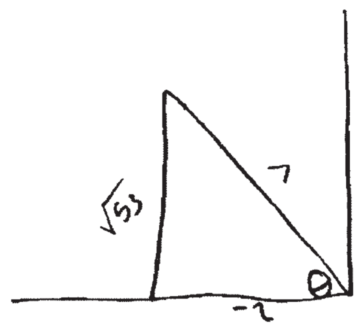
$7^2+2^2=c^2$

$53=c^2$

Score 0: The student made multiple errors.

Question 27

27 Given $\cos\theta = -\frac{2}{7}$ with θ in Quadrant II, find the exact value of sin θ.



SOH
CAH
TOA

$COS = \frac{A}{H}$ ← always a positive

$a^2 + b^2 = c^2$
$-2^2 + b^2 = 7^2$
$-4 + b^2 = 49$
$+4 \quad +4$

Score 0: The student made multiple errors.

Question 28

28 Given $a > 1$, use the properties of rational exponents to determine the value of x for the equation below.

$$\frac{\sqrt[5]{a^{10}}}{(a^3)^{\frac{1}{2}}} = a^x$$

$$\frac{a^{\frac{10}{5}}}{a^{\frac{3}{2}}} = a^x$$

$$\frac{a^{\frac{20}{10}}}{a^{\frac{15}{10}}} = a^x$$

$$a^{\frac{5}{10}} = a^x$$

$$a^{\frac{1}{2}} = a^x$$

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

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

Question 28

28 Given $a > 1$, use the properties of rational exponents to determine the value of x for the equation below.

$$\frac{\sqrt[5]{a^{10}}}{(a^3)^{\frac{1}{2}}} = a^x$$

$$\frac{a^2}{a^{1.5}} = a^{0.5}$$

$$\boxed{x = 0.5}$$

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

Question 28

28 Given $a > 1$, use the properties of rational exponents to determine the value of x for the equation below.

$$\frac{\sqrt[5]{a^{10}}}{(a^3)^{\frac{1}{2}}} = a^x$$

$$\frac{\left(\sqrt[5]{a^{10}}\right)^5}{\left((a^3)^{\frac{1}{2}}\right)^5} = (a^x)^5$$

$$\frac{a^{10}}{(a^3)^{\frac{5}{2}}} = a^{5x}$$

$$\frac{a^{10}}{a^{\frac{15}{2}}} = a^{5x}$$

$$a^{\frac{5}{2}} = a^{5x}$$

Score 1: The student did not determine the value of x.

Question 28

28 Given $a > 1$, use the properties of rational exponents to determine the value of x for the equation below.

$$\frac{\sqrt[5]{a^{10}}}{(a^3)^{\frac{1}{2}}} = a^x$$

$a^{\cancel{2}\cdot\cancel{2}} + a^{\frac{3}{\cancel{2}}\cdot\cancel{2}}$

$a + a^3 = a^4$

$\sqrt[5]{a^{10}} = a^{\frac{10}{5}} = a^2$

$(a^3)^{\frac{1}{2}} = a^{\frac{3}{2}}$

Score 1: The student correctly expressed the numerator and denominator with singular rational exponents.

Question 28

28 Given $a > 1$, use the properties of rational exponents to determine the value of x for the equation below.

$$\frac{\sqrt[5]{a^{10}}}{(a^3)^{\frac{1}{2}}} = a^x \rightarrow \frac{a^{\frac{10}{5}}}{(a^3)^{\frac{1}{2}}} = a^x$$

$$\downarrow$$

$$\frac{(a^2)^{\frac{2}{1}}}{((a^3)\frac{1}{2})^{\frac{2}{1}}} = ax$$

$$\downarrow$$

$$\frac{a^4}{a^3} = a$$

$$\downarrow$$

$$\cancel{a^x = a^{\frac{4}{3}}}$$

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

$\frac{1}{2} \times \frac{2}{1} = \frac{2}{2} = 1$

$x = \frac{4}{3}$

Score 0: The student made multiple errors.

Question 28

28 Given $a > 1$, use the properties of rational exponents to determine the value of x for the equation below.

$$\frac{\sqrt[5]{a^{10}}}{(a^3)^{\frac{1}{2}}} = a^x$$

$$\frac{a^{\frac{10}{5}}}{a^{\frac{1}{2}}} = a^x$$

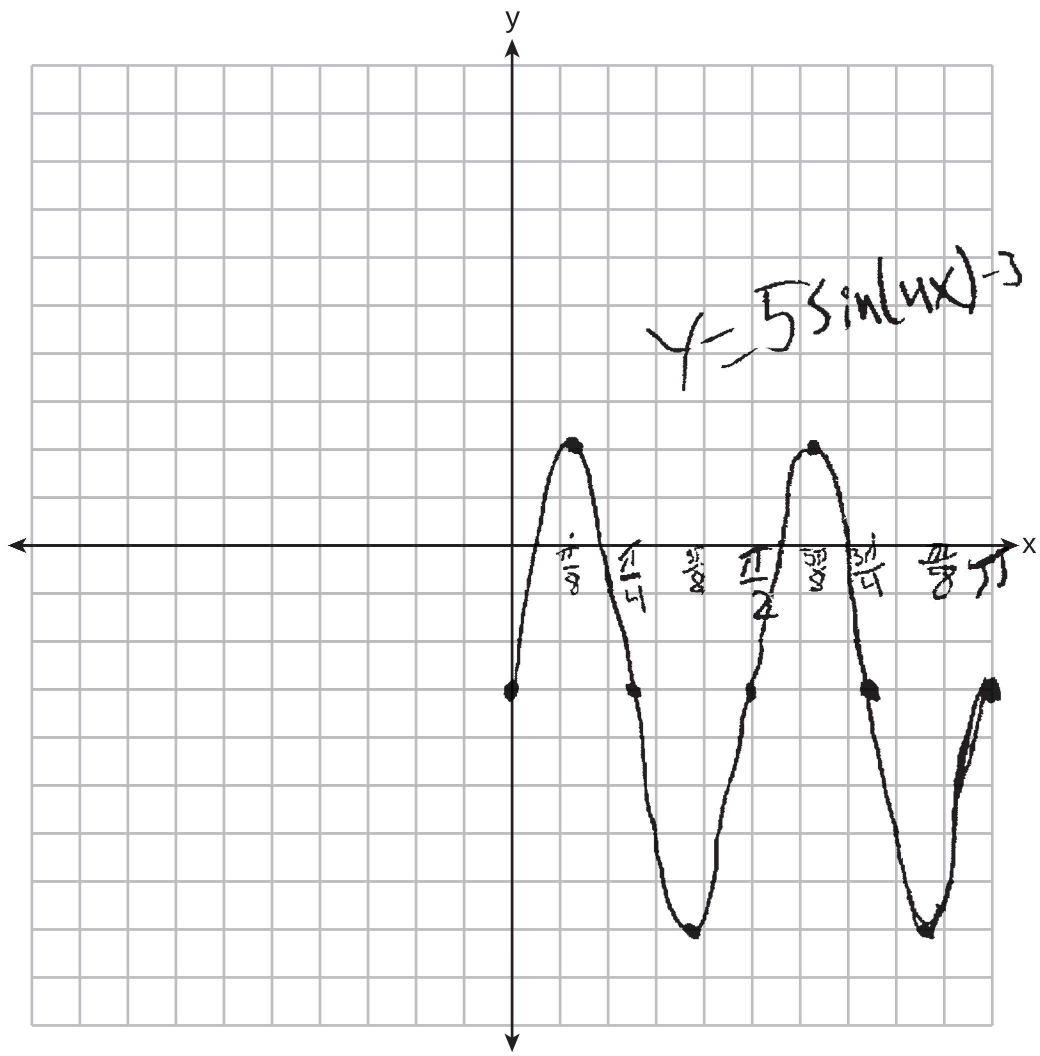
$$\frac{a^2}{a^{\frac{1}{2}}} = a^x$$

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

Score 0: The student made multiple errors.

Question 29

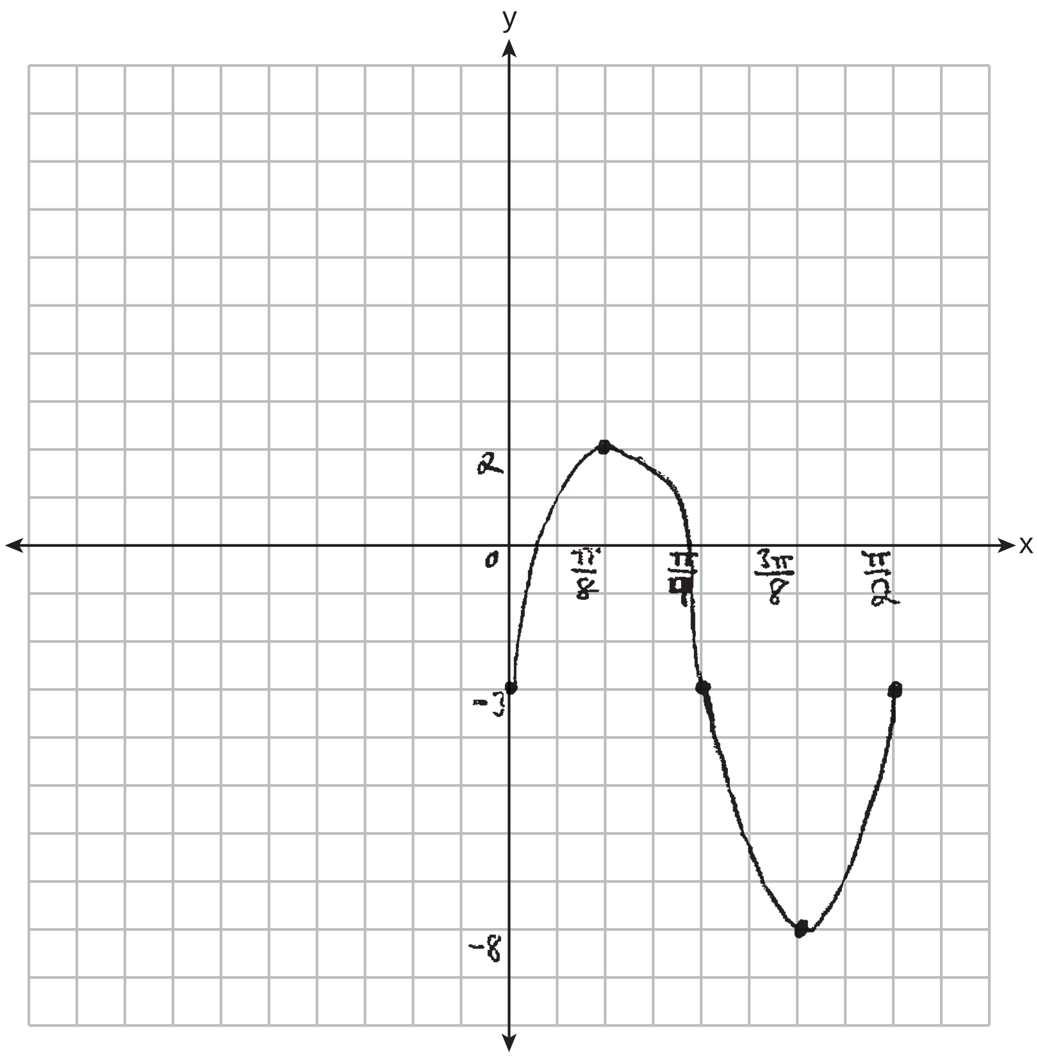
29 Graph *at least one* cycle of $y = 5\sin(4x) - 3$ on the set of axes below.



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

Question 29

29 Graph *at least one* cycle of $y = 5\sin(4x) - 3$ on the set of axes below.



$T = \frac{\pi}{2}$

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

Question 29

29 Graph *at least one* cycle of $y = 5\sin(4x) - 3$ on the set of axes below.

$a = 5$

$b = 4$

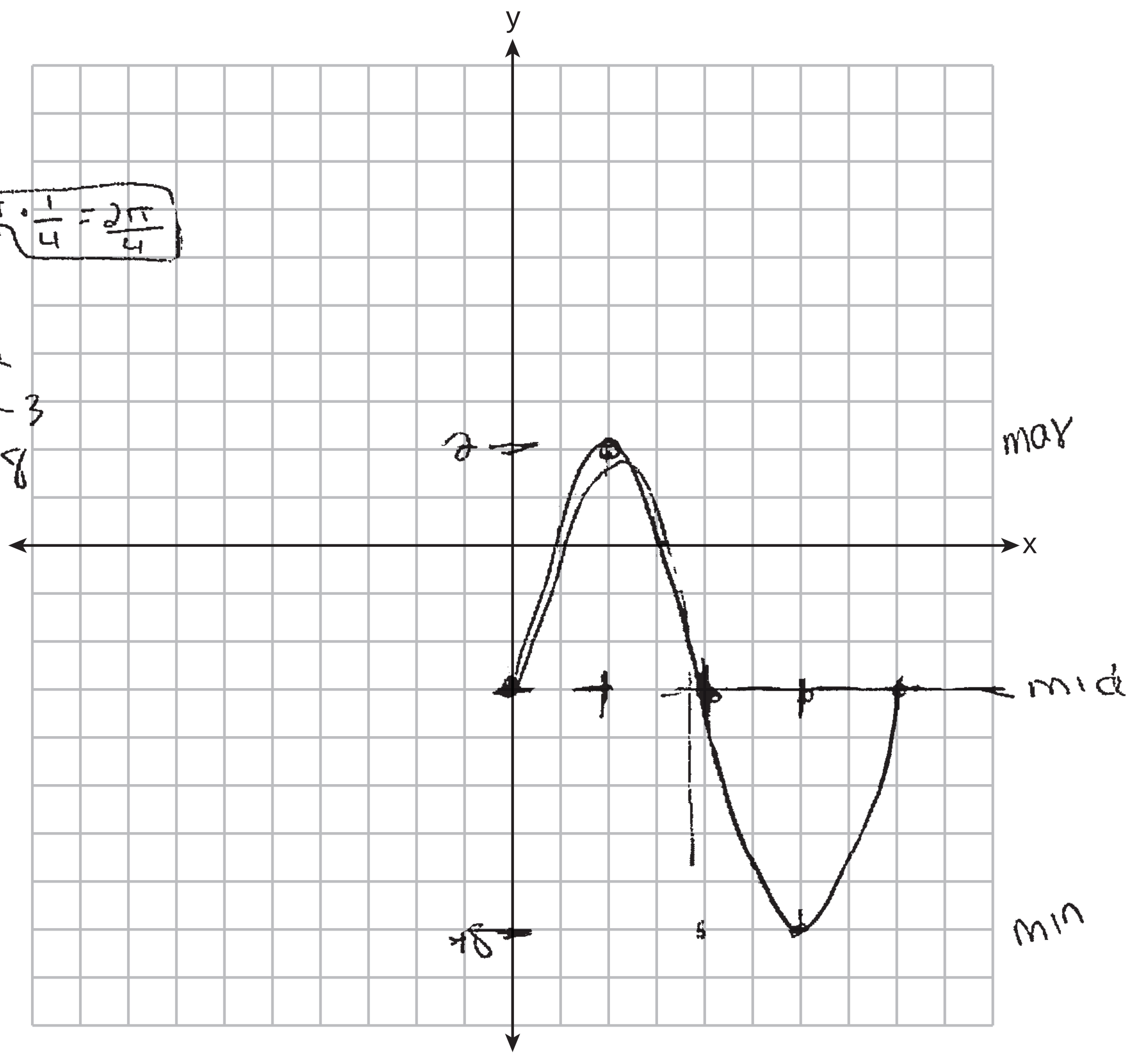
$p = \frac{1}{2} \frac{2\pi}{\pi} \cdot \frac{1}{4} = \frac{2\pi}{4}$

$c.p = 4$

max = 2

mid = -3

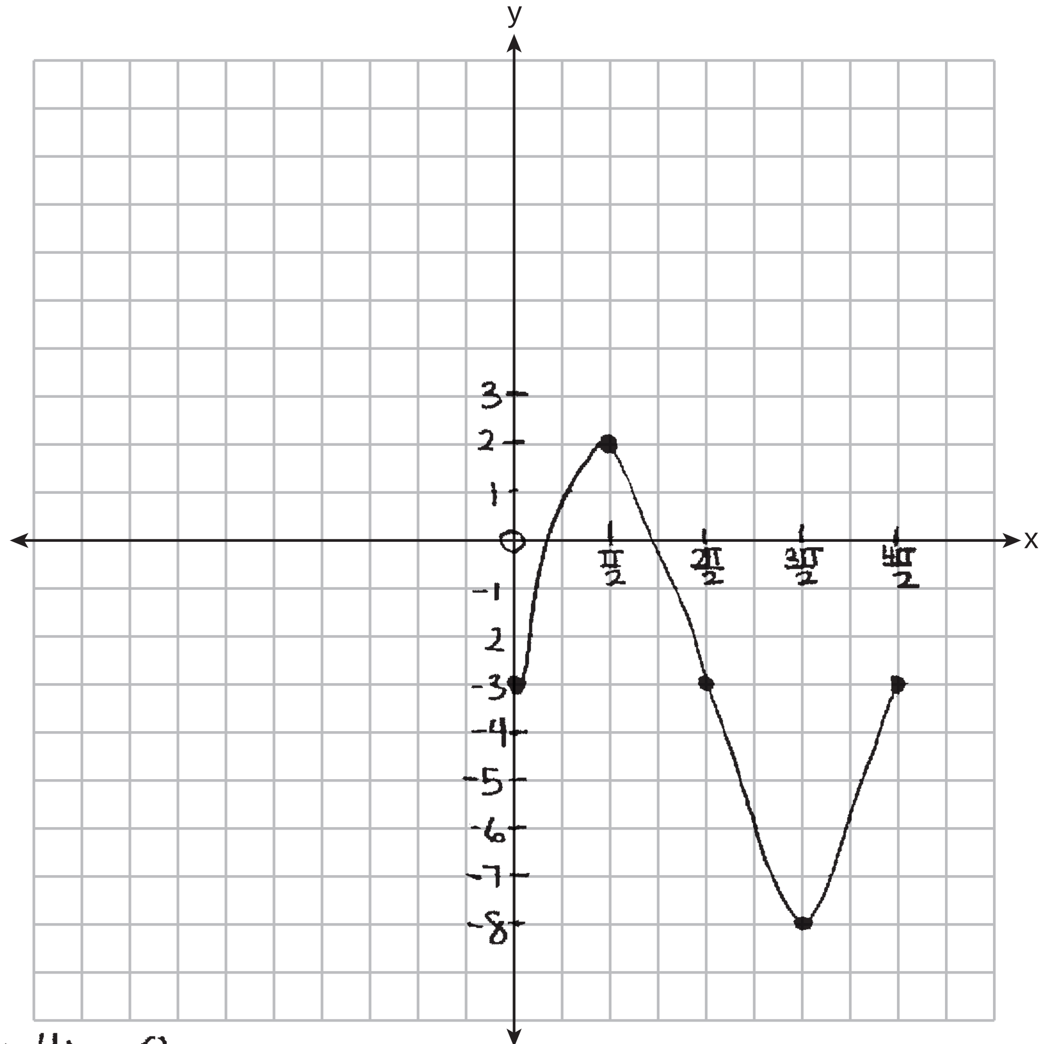
min = -8



Score 1: The student did not provide a scale on the x-axis.

Question 29

29 Graph *at least one* cycle of $y = 5\sin(4x) - 3$ on the set of axes below.



Period: $\frac{4x = 0}{4}$ $x = 0$

$-1: \; 5(-1) - 3 = -8$ Min

$1: \; 5(1) - 3 = 2$ Max

$\frac{2\pi}{0} = 2\pi$

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

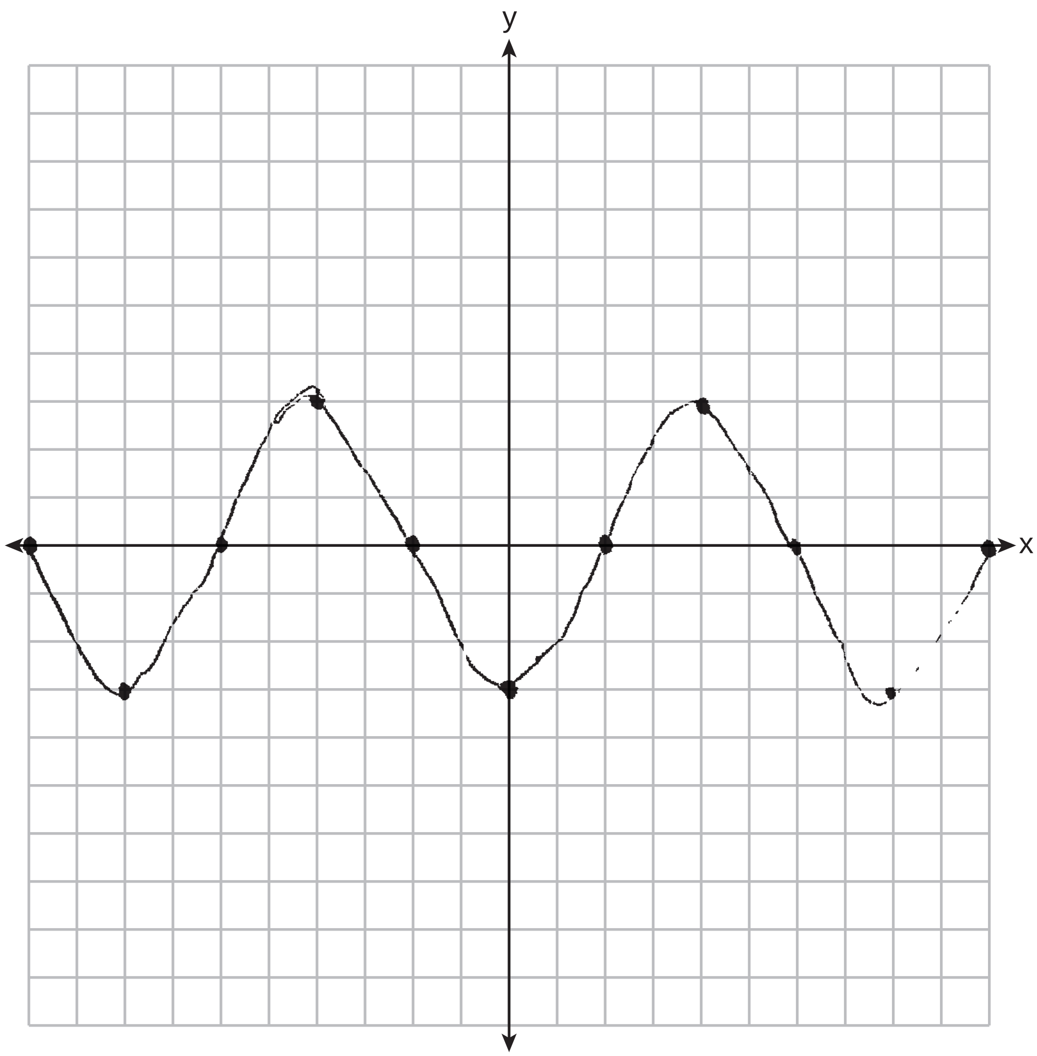
$0, \frac{\pi}{2}, \frac{2\pi}{2}, \frac{3\pi}{2}, \frac{4\pi}{2}$

Midline: -3

Score 1: The student has an incorrect scale on the *x*-axis.

Question 29

29 Graph *at least one* cycle of $y = 5\sin(4x) - 3$ on the set of axes below.

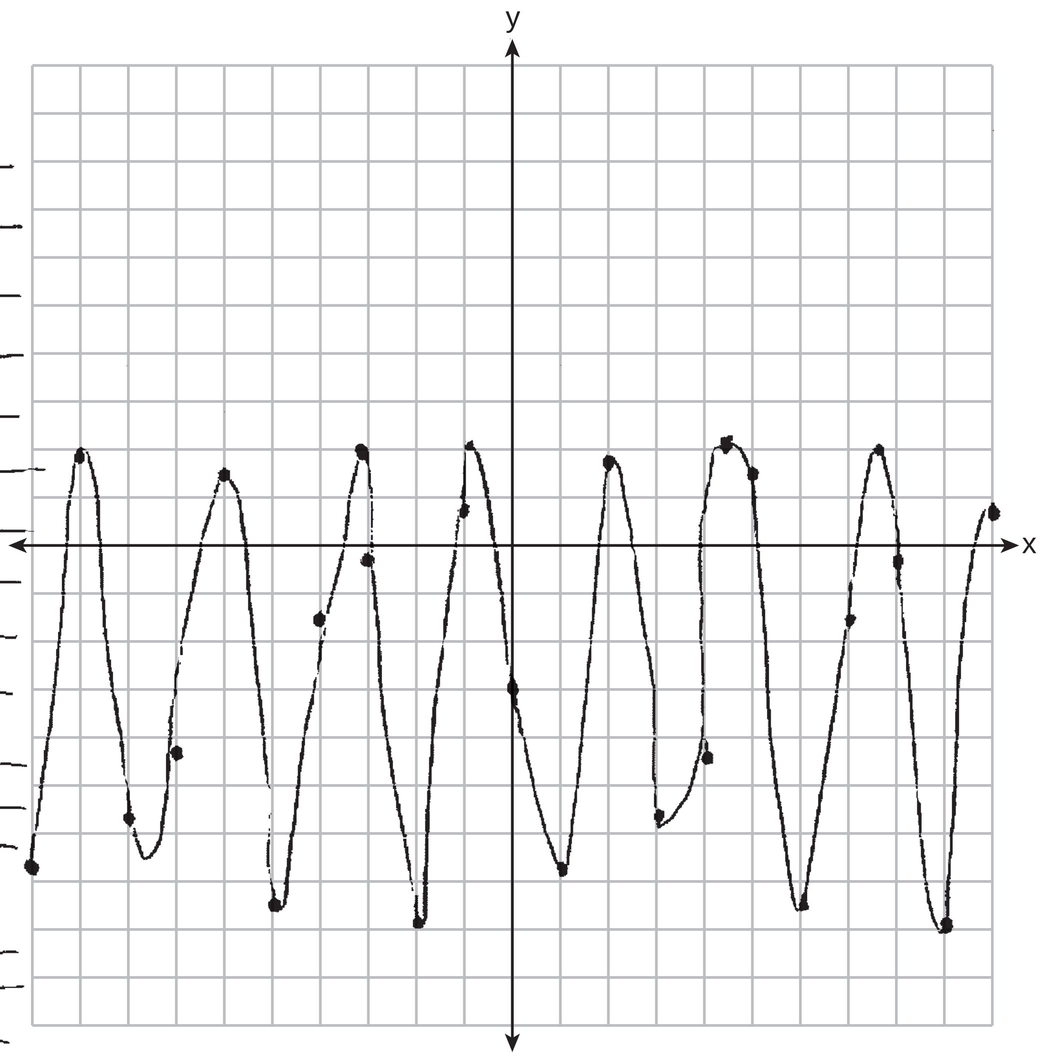


Score 0: The student made multiple graphing errors.

Question 29

29 Graph *at least one* cycle of $\boxed{y = 5\sin(4x) - 3}$ on the set of axes below.

X	Y
-10	-6.726
-9	1.9589
-8	-5.757
-7	-4.355
-6	1.5279
-5	-7.565
-4	-1.56
-3	-.3171
-2	-7.947
-1	.78401
0	-3
1	-6.784
2	1.9468
3	-5.683
4	-4.44
5	1.5647
6	-7.528
7	-1.645
8	-.2429
9	-7.959
10	.72557



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

Question 30

30 The cost of a brand-new electric-hybrid vehicle is listed at $33,400, and the average annual depreciation for the vehicle is 15%. The car's value can be modeled by the function $V(x) = 33{,}400(0.85)^x$, where x represents the years since purchase.

Julia and Jacob have each written a function that is equivalent to the original.

$$\text{Jacob's function: } V(x) = 33{,}400(0.1422)^{\frac{1}{12}x}$$

$$\text{Julia's function: } V(x) = 33{,}400(0.9865)^{12x}$$

Whose function is correctly rewritten to reveal the approximate monthly depreciation rate? Justify your answer.

Julia did, if you raise the original .85 and do 1 month which is 1/12 of a year you get .9865 which is what Julia has.

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

Question 30

30 The cost of a brand-new electric-hybrid vehicle is listed at \$33,400, and the average annual depreciation for the vehicle is 15%. The car's value can be modeled by the function $V(x) = 33{,}400(0.85)^x$, where x represents the years since purchase.

Julia and Jacob have each written a function that is equivalent to the original.

$$\text{Jacob's function: } V(x) = 33{,}400(0.1422)^{\frac{1}{12}x}$$

$$\text{Julia's function: } V(x) = 33{,}400(0.9865)^{12x}$$

Whose function is correctly rewritten to reveal the approximate monthly depreciation rate? Justify your answer.

Julia

$0.85^{\frac{1}{12}} = 0.9865$

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

30 The cost of a brand-new electric-hybrid vehicle is listed at \$33,400, and the average annual depreciation for the vehicle is 15%. The car's value can be modeled by the function $V(x) = 33{,}400(0.85)^x$, where x represents the years since purchase.

Julia and Jacob have each written a function that is equivalent to the original.

Jacob's function: $V(x) = 33{,}400(0.1422)^{\frac{1}{12}x}$

Julia's function: $V(x) = 33{,}400(0.9865)^{12x}$

Whose function is correctly rewritten to reveal the approximate monthly depreciation rate? Justify your answer.

$33{,}400(.85)^{x \cdot \frac{1}{12}x}$ $\quad (.85^{\frac{12}{1}})^x$

Julia's Function

$V(x) = 33{,}400(.9865)^{12x}$

Score 1: The student gave an incomplete justification.

Question 30

30 The cost of a brand-new electric-hybrid vehicle is listed at $33,400, and the average annual depreciation for the vehicle is 15%. The car's value can be modeled by the function $V(x) = 33{,}400(0.85)^x$, where x represents the years since purchase.

Julia and Jacob have each written a function that is equivalent to the original.

$$\text{Jacob's function: } V(x) = 33{,}400(0.1422)^{\frac{1}{12}x}$$

$$\text{Julia's function: } V(x) = 33{,}400(0.9865)^{12x}$$

Whose function is correctly rewritten to reveal the approximate monthly depreciation rate? Justify your answer.

Julia's function is correct beeurse theirs 12 months in a year plus the average ~~[illegible]~~ annual would be higher perctaange

Score 1: The student gave an incomplete justification.

Question 30

30 The cost of a brand-new electric-hybrid vehicle is listed at $33,400, and the average annual depreciation for the vehicle is 15%. The car's value can be modeled by the function $V(x) = 33{,}400(0.85)^x$, where x represents the years since purchase.

Julia and Jacob have each written a function that is equivalent to the original.

$$\text{Jacob's function: } V(x) = 33{,}400(0.1422)^{\frac{1}{12}x}$$

$$\text{Julia's function: } V(x) = 33{,}400(0.9865)^{12x}$$

Whose function is correctly rewritten to reveal the approximate monthly depreciation rate? Justify your answer.

Julia

$x\log(.85) = 12x(\log .9865)$

$\frac{x}{x} = 12\left(\frac{\log .9865}{\log .85}\right)$

$1 \approx 1$

Score 0: The student gave an incorrect justification.

Question 30

30 The cost of a brand-new electric-hybrid vehicle is listed at $33,400, and the average annual depreciation for the vehicle is 15%. The car's value can be modeled by the function $V(x) = 33{,}400(0.85)^x$, where x represents the years since purchase.

Julia and Jacob have each written a function that is equivalent to the original.

$$\text{Jacob's function: } V(x) = 33{,}400(0.1422)^{\frac{1}{12}x}$$

$$\text{Julia's function: } V(x) = 33{,}400(0.9865)^{12x}$$

Whose function is correctly rewritten to reveal the approximate monthly depreciation rate? Justify your answer.

$V(x) = 33{,}400(.85)^4$

$V(4) = \$17{,}435.01$

Jacob $= 33400(.1422)^{\frac{1}{12}(4)}$

$V(4) = \$17{,}433.30$

Jacob comes closer

Julia $= 33400(.9865)^{12(4)}$

$V(4) = \$17394.29$

Score 0: The student response did not satisfy the criteria for one or more credits.

Question 31

31 Write a recursive formula for the sequence 8, 20, 50, 125, 312.5,…

$a_1 = 8$

$a_n = 2.5a_{n-1}$

$r = 2.5$

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

Question 31

31 Write a recursive formula for the sequence 8, 20, 50, 125, 312.5,…

$a_{(n+1)} = a_{(n)} \cdot 2.5$ when $a_1 = 8$

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

Question 31

31 Write a recursive formula for the sequence 8, 20, 50, 125, 312.5,…

$$a_n = 8(2.5)^{n-1}$$

Score 1: The student wrote an explicit formula.

Question 31

31 Write a recursive formula for the sequence 8, 20, 50, 125, 312.5,…

$a = 2.5(a_{n-1})$

$a_1 = 8$

Score 1: The student made a notation error.

Question 31

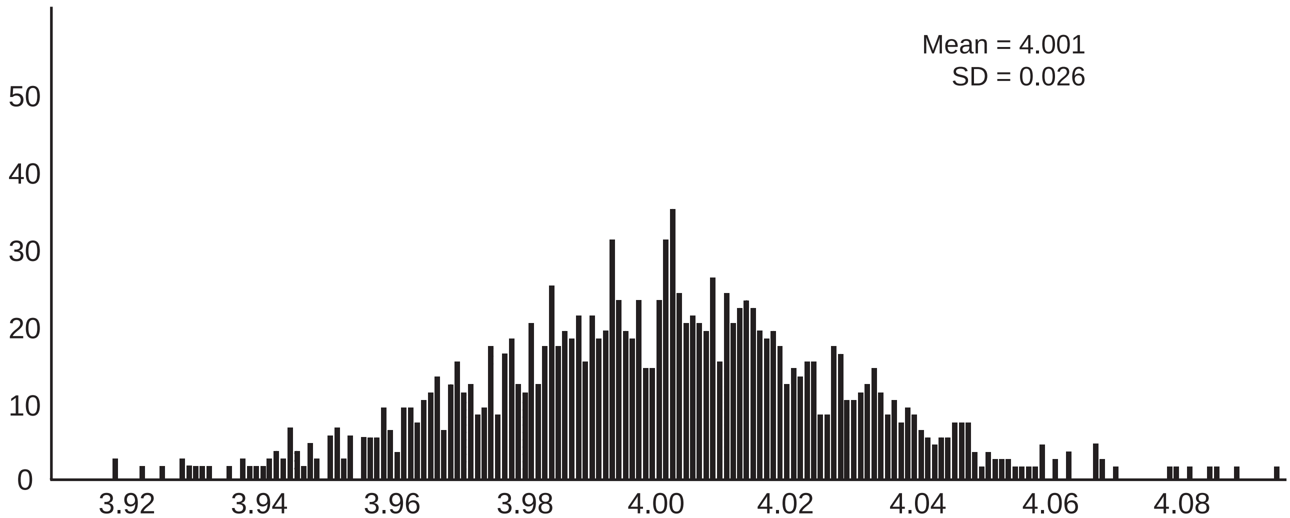
31 Write a recursive formula for the sequence 8, 20, 50, 125, 312.5,…

$8+(3\cdot 5)^2$

Score 0: The student response did not satisfy the criteria for one or more credits.

Question 32

32 A grocery store orders 50 bags of oranges from a company's distribution center. The bags have a mean weight of 3.85 pounds per bag. The company claims that their bags of oranges have a mean weight of 4 pounds. The grocery store ran a simulation of 50 bags, 2500 times, assuming a mean of 4 pounds. The results are shown below.



Is the mean weight of the grocery store's sample unusual? Explain using the results of the simulation.

$4.001 + 2(.026) = 4.053$

$4.001 - 2(.026) = 3.949$

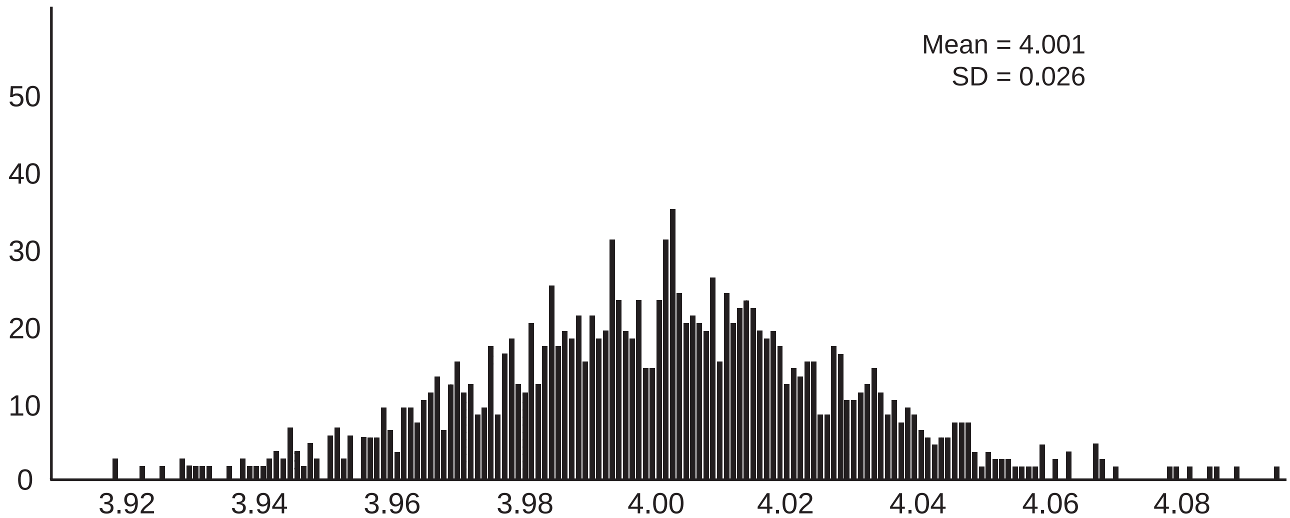
95% Confidence Interval: 3.949–4.053

the mean weight of the storet sample is unusual because it is outside the 95% confidence interval of 3.949–4.053.

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

Question 32

32 A grocery store orders 50 bags of oranges from a company's distribution center. The bags have a mean weight of 3.85 pounds per bag. The company claims that their bags of oranges have a mean weight of 4 pounds. The grocery store ran a simulation of 50 bags, 2500 times, assuming a mean of 4 pounds. The results are shown below.



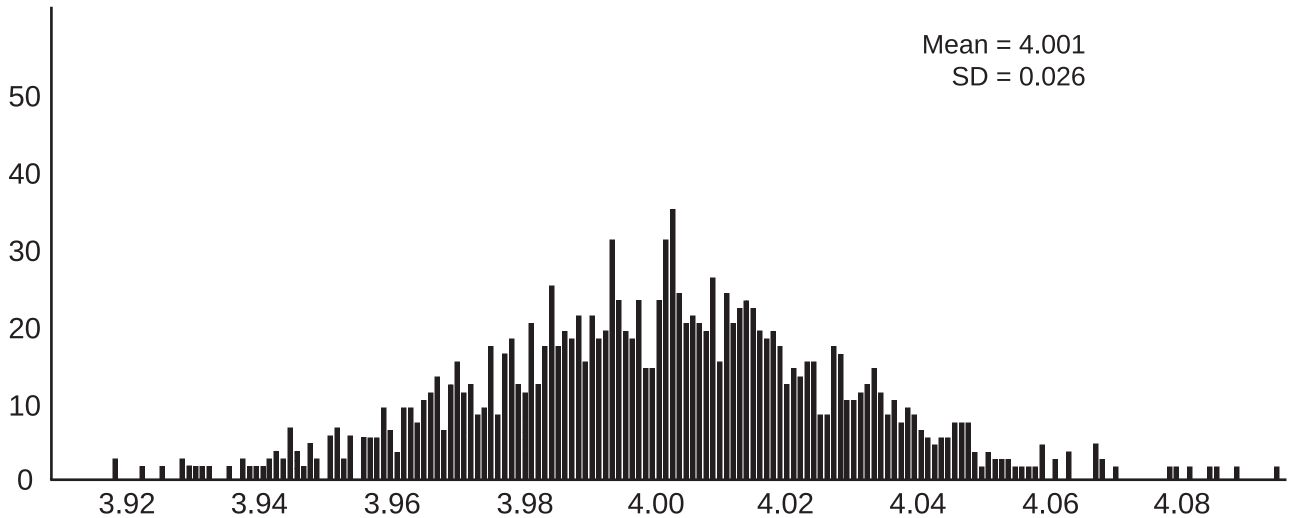
Is the mean weight of the grocery store's sample unusual? Explain using the results of the simulation.

Yes, a mean of 3.85 pounds is not even shown on the graph, which means it must be extremely unlikely to happen.

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

Question 32

32 A grocery store orders 50 bags of oranges from a company's distribution center. The bags have a mean weight of 3.85 pounds per bag. The company claims that their bags of oranges have a mean weight of 4 pounds. The grocery store ran a simulation of 50 bags, 2500 times, assuming a mean of 4 pounds. The results are shown below.



Is the mean weight of the grocery store's sample unusual? Explain using the results of the simulation.

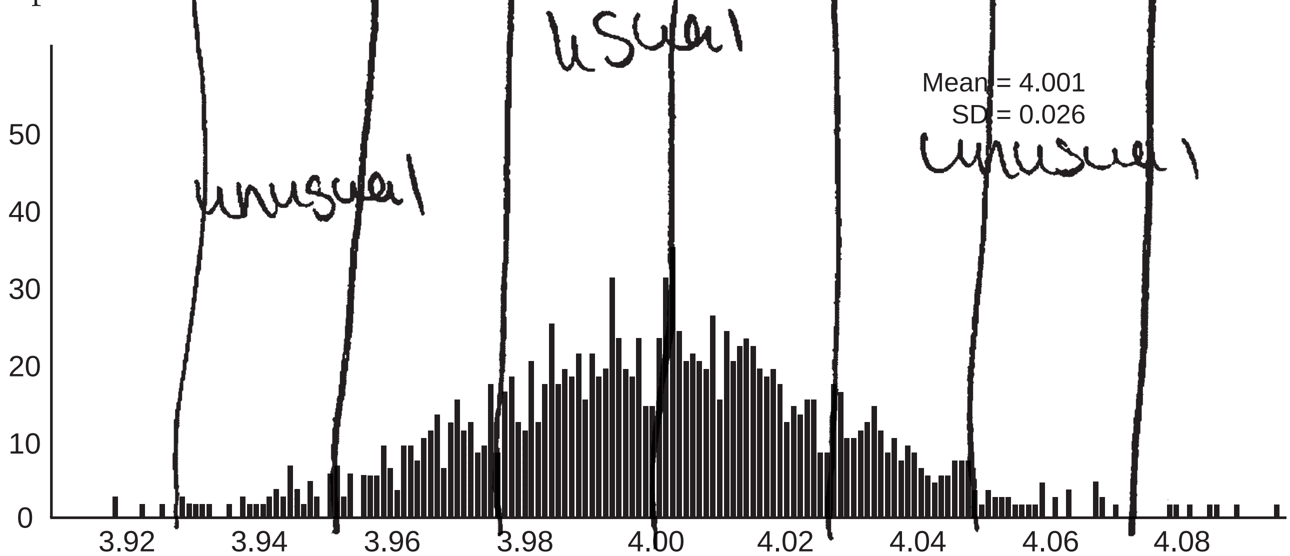
4.001+0.026 4.001−0.026
4.027 3.975

Very unusual, it is not within the 95% confidence interval of 3.975 to 4.027.

Score 1: The student used one standard deviation to calculate the interval.

Question 32

32 A grocery store orders 50 bags of oranges from a company's distribution center. The bags have a mean weight of 3.85 pounds per bag. The company claims that their bags of oranges have a mean weight of 4 pounds. The grocery store ran a simulation of 50 bags, 2500 times, assuming a mean of 4 pounds. The results are shown below.



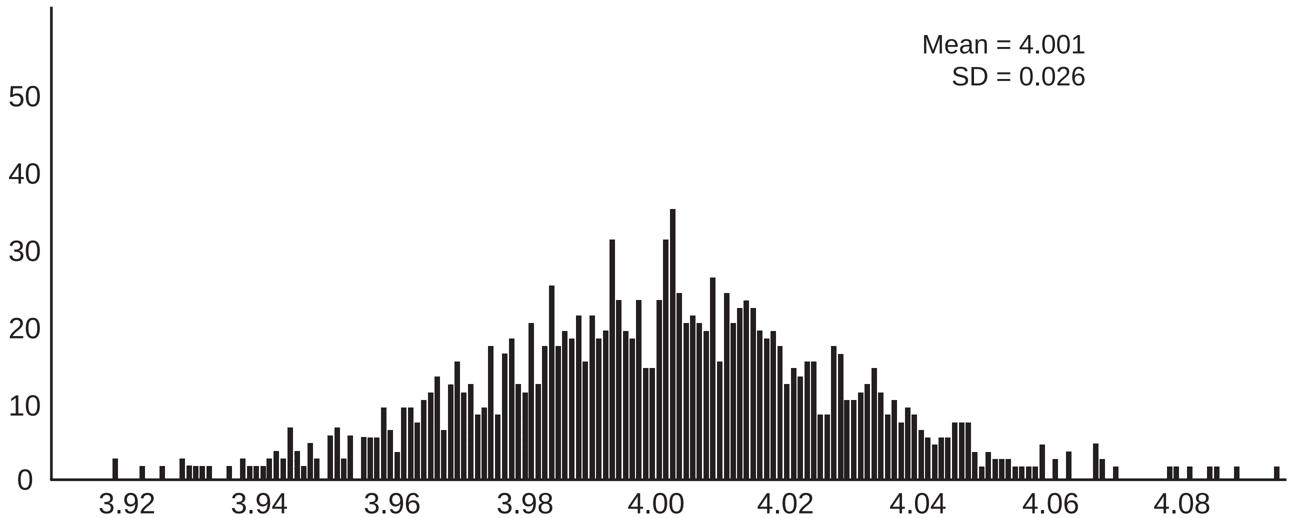
Is the mean weight of the grocery store's sample unusual? Explain using the results of the simulation.

Unusual because two SD away.

Score 1: The student gave an incomplete explanation.

Question 32

32 A grocery store orders 50 bags of oranges from a company's distribution center. The bags have a mean weight of 3.85 pounds per bag. The company claims that their bags of oranges have a mean weight of 4 pounds. The grocery store ran a simulation of 50 bags, 2500 times, assuming a mean of 4 pounds. The results are shown below.



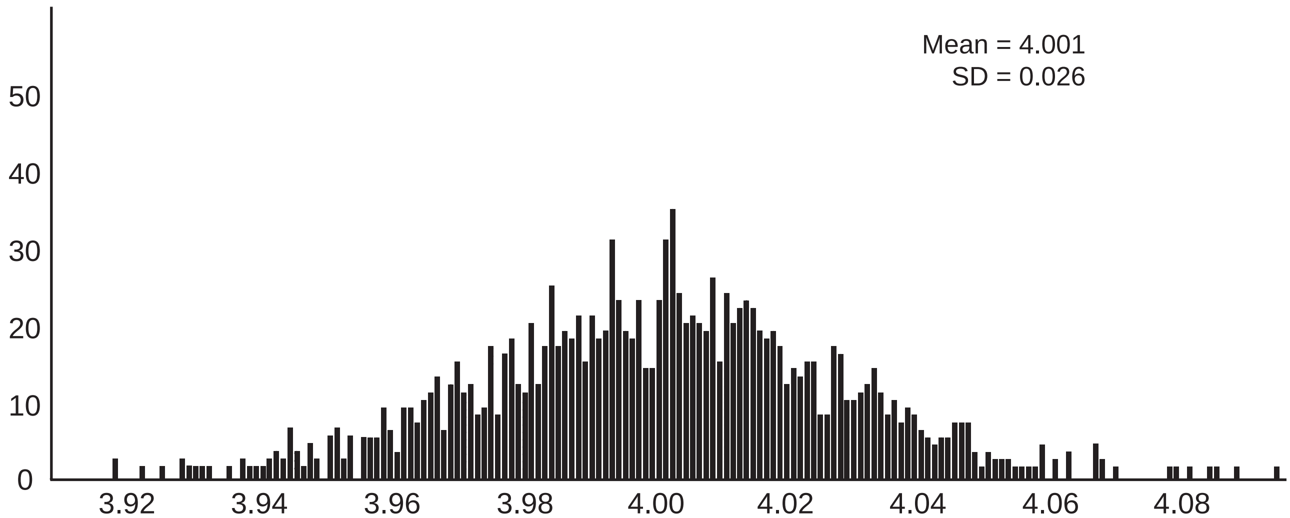
Is the mean weight of the grocery store's sample unusual? Explain using the results of the simulation.

Yes, because the company was claiming that they have a mean weight of 4 but there is a majority that is either more or less than 4.

Score 0: The student gave an incorrect explanation.

Question 32

32 A grocery store orders 50 bags of oranges from a company's distribution center. The bags have a mean weight of 3.85 pounds per bag. The company claims that their bags of oranges have a mean weight of 4 pounds. The grocery store ran a simulation of 50 bags, 2500 times, assuming a mean of 4 pounds. The results are shown below.



Is the mean weight of the grocery store's sample unusual? Explain using the results of the simulation.

No. Mean is the average and 4.001 is in the middle of the data

Score 0: The student response did not satisfy the criteria for one or more credits.

Question 33

33 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let *A* be the event that the guest room has a view of the lake, and let *B* be the event that the guest room has a queen-size bed. Events *A* and *B* are found to be independent of each other.

Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed.

$P(A \cap B) = P(A) \cdot P(B) =$

0.1776

Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = 0.24 + 0.74 - 0.1776$

$= 0.98 - 0.1776$

$P(A \cup B) = 0.8024$

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

Question 33

33 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let *A* be the event that the guest room has a view of the lake, and let *B* be the event that the guest room has a queen-size bed. Events *A* and *B* are found to be independent of each other.

Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed.

multiply $\times$

$p(L) \times p(Q)$

$.24 \times .74 = 17.76\%$

Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

add

$p(L) + p(Q) - p(L \text{ and } Q)$

$.24 + .74$

$98\% - 17.76\%$

$98\% - 17.76\%$

80.24%

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

Question 33

33 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let A be the event that the guest room has a view of the lake, and let B be the event that the guest room has a queen-size bed. Events A and B are found to be independent of each other.

Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed.

Lake = 0.24
Queen = 0.74

$$\begin{array}{r} 0.24 \\ + 0.74 \\ \hline .1776 \end{array}$$

17.76% chance

Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

$$\begin{array}{r} 0.24 \\ + 0.74 \\ \hline 0.98 \end{array}$$

There is a 98% chance that it will be either.

Score 3: The student did not subtract $P(A \cap B)$ in the second part.

Question 33

33 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let *A* be the event that the guest room has a view of the lake, and let *B* be the event that the guest room has a queen-size bed. Events *A* and *B* are found to be independent of each other.

Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed.

guest w/ view = .24
guest w/ queen = .74

$.24(.74) = .1776$

$\boxed{.178}$

Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

$P(A) + P(B) - P(A \& B)$

$.24 + .74 - .178$

$\boxed{.802}$

Score 3: The student rounded instead of stating the exact value.

Question 33

33 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let A be the event that the guest room has a view of the lake, and let B be the event that the guest room has a queen-size bed. Events A and B are found to be independent of each other.

Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed.

Lake view .24 Queen .74

100−

$P(\text{Lv and Q}) = P(\text{Lv}) + P(\text{Q}) - P(\text{Lv}\ldots)$ .2

$.24 + .74 = .98$

$100 - 98 = .2$

There is a .2 probability that a random guest will have both.

Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

$P(\text{Lv or Q}) = P(\text{Lv}) + P(\text{Q}) - P(\text{Lv and Q})$

$.24 + .74 - .2$

There is a .78 probability that the guest will have the lake view or a queen bed.

Score 2: The student did not receive any credit for the first part.

33 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let A be the event that the guest room has a view of the lake, and let B be the event that the guest room has a queen-size bed. Events A and B are found to be independent of each other.

Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed.

view of lake: 0.24
queen size bed: 0.74
.98

$P(L+Q) = P(L) \cdot P(Q)$
$= (.24)(.74)$
$= .1776$

Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

$.98 = (.24)(.74) - P(L+Q)$

$.98 = .1776 - x$

0.1678

Score 2: The student did not receive any credit for the second part.

Question 33

33 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let A be the event that the guest room has a view of the lake, and let B be the event that the guest room has a queen-size bed. Events A and B are found to be independent of each other.

Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed.

0.24×0.74

$\frac{6}{25} \times \frac{37}{50}$

$\frac{111}{625}$ or 0.18

Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

0.24×0.74

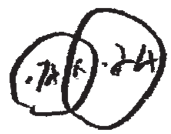
0.18

Score 1: The student rounded in the first part and received no credit for the second part.

Question 33

33 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let *A* be the event that the guest room has a view of the lake, and let *B* be the event that the guest room has a queen-size bed. Events *A* and *B* are found to be independent of each other.

Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed.



.177

.74(.24) =

Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

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

Question 33

33 At the Lakeside Resort, the probability that a guest room has a view of the lake is 0.24. The probability that a guest room has a queen-size bed is 0.74. Let *A* be the event that the guest room has a view of the lake, and let *B* be the event that the guest room has a queen-size bed. Events *A* and *B* are found to be independent of each other.

Determine the exact probability that a randomly selected guest room has a view of the lake and a queen-size bed.

$P(A \cap B) = P(A) + P(B)$

$.98$

$\boxed{9.8\%}$

Determine the exact probability that a randomly selected guest room has a view of the lake or a queen-size bed.

$$P(A|B) = \frac{P(A \cup B)}{P(B)}$$

$$\frac{P(A) - P(B) + P(A \cap B)}{P(B)}$$

$$\frac{.24 - .74 + .98}{.74}$$

$.648$

$.65$

Score 0: The student response did not satisfy the criteria for one or more credits.

Question 34

34 Which function has a greater average rate of change on the interval [−1,4]? Justify your answer.

x	m(x)
−2	−3
−1	1
0	1
1	3
2	13
3	37
4	81
5	151

$p(x) = 3^x + 1$

$p(-1) = 1\frac{1}{3}$

$p(4) = 82$

$\frac{81-1}{4-(-1)} = \frac{80}{5} = 16$

$\frac{82-1\frac{1}{3}}{5} = \frac{80\frac{2}{3}}{5} = 16.1\overline{333}$

$16.1\overline{3} > 16$

$p(x) > m(x)$

$\boxed{p(x)}$

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

Question 34

34 Which function has a greater average rate of change on the interval [−1,4]? Justify your answer.

x	m(x)
−2	−3
−1	1
0	1
1	3
2	13
3	37
4	81
5	151

$p(x) = 3^x + 1$

x	P(x)
−1	$1.3\bar{3}$
4	82

$\frac{81-1}{4--1}$

$\frac{82-1.3\bar{3}}{4--1}$

m(x) Average rate of change = 16

P(x) Average rate of change is ≈ 16.1

P(x) has a greater rate of change over the interval [−1,4].

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

Question 34

34 Which function has a greater average rate of change on the interval [−1,4]? Justify your answer.

x	m(x)
−2	−3
−1	1
0	1
1	3
2	13
3	37
4	81
5	151

$p(x) = 3^x + 1$

-3+1

y=-2

y=82

$\frac{82+2}{4+1} = \frac{84}{5} = 16.8$

$\frac{81-1}{4+1} = \frac{80}{5} = 16$

$p(x)=3^x+1$ is greater because $16<16.8$

Score 3: The student made one computational error.

Question 34

34 Which function has a greater average rate of change on the interval $[-1,4]$? Justify your answer.

x	m(x)
−2	−3
−1	1
0	1
1	3
2	13
3	37
4	81
5	151

$x=-1 \quad m(x)=1$

$x=4 \quad m(x)=81$

$81-1=80$

$p(x) = 3^x + 1$

$x=-1 \quad p(x)=1\frac{1}{3}$

$x=4 \quad p(x)=82$

$82-1\frac{1}{3}=80\frac{2}{3}$

p(x) has a greater avg rate of change because it's $80\frac{2}{3}$ but m(x) has a rate of change of 80

Score 2: The student used an incorrect formula for average rate of change.

Question 34

34 Which function has a greater average rate of change on the interval [−1,4]? Justify your answer.

x	m(x)
−2	−3
−1	1
0	1
1	3
2	13
3	37
4	81
5	151

$p(x) = 3^x + 1$

p(x) = 3^x +1 has the greater average rate of change

$x=-1 \quad y=1$

$x=4 \quad y=81$

$\frac{81-1}{2}$

$p(-1)=3^{-1}+1$

$p(-1)=1.3\ldots.$

$p(4)=3^4+1$

$p(4)=82$

$\frac{82-1.3}{2}$

Score 2: The student used an incorrect formula for average rate of change.

Question 34

34 Which function has a greater average rate of change on the interval $[-1,4]$? Justify your answer.

x	m(x)
-2	-3
-1 x1	1 y1
0	1
1	3
2	13
3	37
4 x2	81 y2
5	151

$p(x) = 3^x + 1$

$3^{-1} + 1 = 1.\overline{3}$

$3^4 + 1 = 82$

$\boxed{80.\overline{6}}$

$\frac{81-1}{4-(-1)} = \boxed{16}$

Score 1: The student correctly calculated the average rate of change for m.

Question 34

34 Which function has a greater average rate of change on the interval [−1,4]? Justify your answer.

x	m(x)
−2	−3
−1	1
0	1
1	3
2	13
3	37
4	81
5	151

$p(x) = 3^x + 1$

$3^1 + 1$

4

$3^4 + 1$

$81 + 1$

82

$x_1 = -1$

$y_1 = 4$

$x_2 = 4$

$y_2 = 82$

$x_1 = -1$

$y_1 = 1$

$x_2 = 4$

$y_2 = 81$

$\frac{x_2 - x_1}{y_2 - y_1}$

$\frac{4-(-1)}{81-1}$

$\frac{5}{80}$

$\frac{x_2 - x_1}{y_2 - y_1}$

$\frac{4-(-1)}{82-4} = \frac{5}{78}$

$\frac{5}{80} < \frac{5}{78}$

$p(x)$ has a greater average rate of change on the given interval because it's rate of change is $\frac{5}{78}$ which is greater then $m(x)$, which is $\frac{5}{80}$.

Score 1: The student made a substitution error and incorrectly calculated the average rate of change.

Question 34

34 Which function has a greater average rate of change on the interval [−1,4]? Justify your answer.

x	m(x)
−2	−3
−1	1
0	1
1	3
2	13
3	37
4	81
5	151

$p(x) = 3^x + 1$

x	p(x)
-1	$1.\overline{3}$
0	2
1	4
2	10
3	28
4	82

$\frac{-3+1}{-2+1} = \frac{-2}{-1} = 2$

$y = 2x + b$

$-3 = 2(-2)$
$+4 \quad -4$

$-1 = b$

$y = 2x - 1$

p(x) has the greater rate of change because it changes the most as x increases

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

Question 34

34 Which function has a greater average rate of change on the interval $[-1,4]$? Justify your answer.

x	m(x)
−2	−3
−1	1
0	1
1	3
2	13
3	37
4	81
5	151

$p(x) = 3^x + 1$

x	m(x)
-2	1.1
-1	1.3
0	2
1	4
2	10
3	28
4	82
5	244

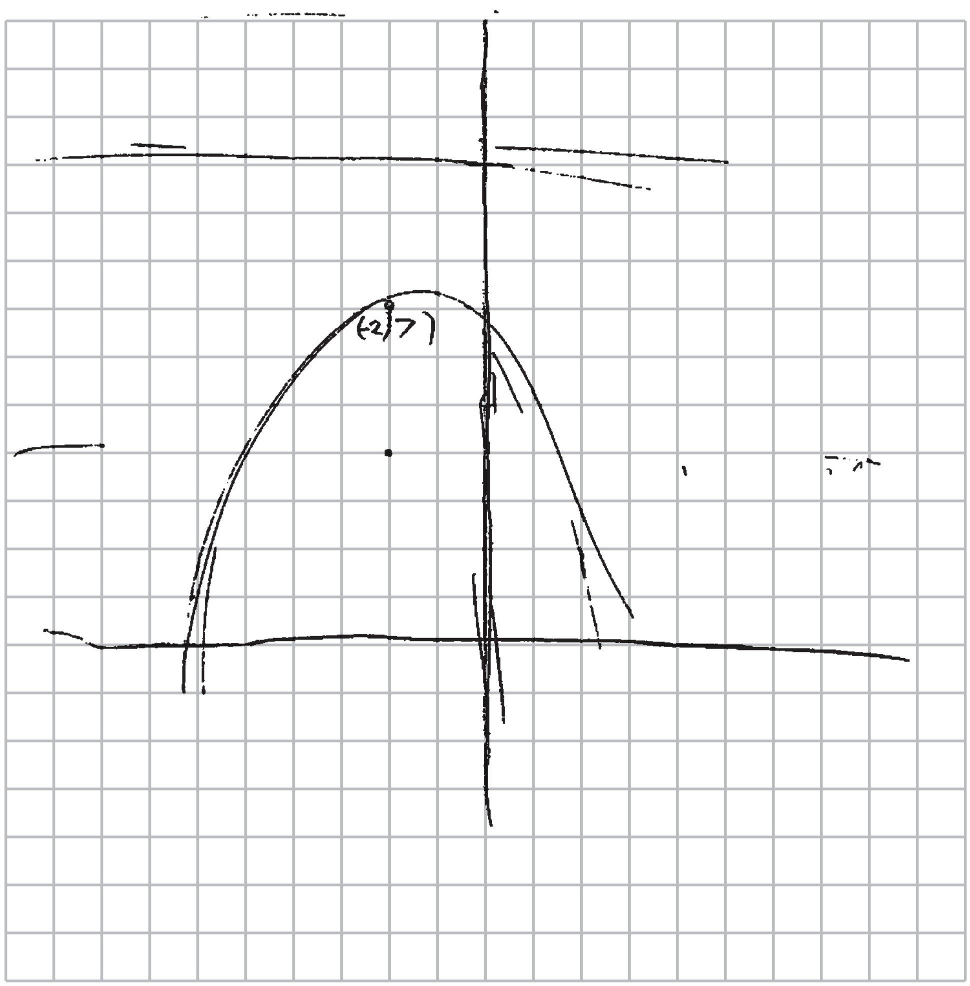
This graph has a greater Average rate of change because the numbers are higher

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

Question 35

35 Determine an equation for the parabola with focus $(-2, 4)$ and directrix $y = 10$. (The use of the grid below is optional.)

$y = -\frac{1}{4(3)}(x-(-2))^2 + 7$



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

Question 35

35 Determine an equation for the parabola with focus $(-2, 4)$ and directrix $y = 10$. (The use of the grid below is optional.)

$$\sqrt{(x+2)^2+(y-4)^2} = \sqrt{(x-x)^2+(y-10)^2}$$

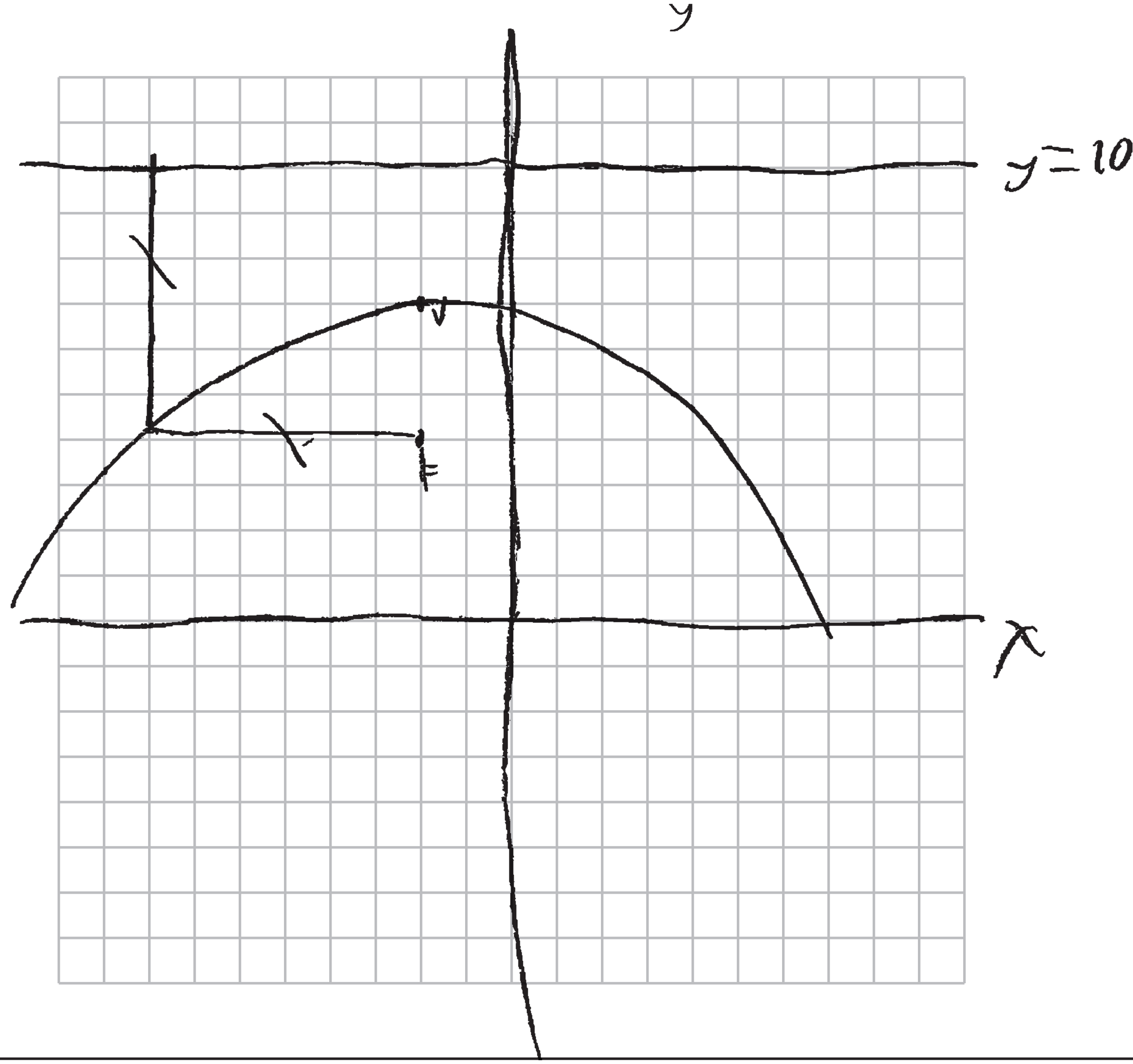
$$(x+2)^2(y-4)^2 = (y-10)^2$$

$$x^2+4x+4+y^2-8y+16 = y^2-20y+100$$

$$-y^2+8y-100 \qquad -y^2+8y-100$$

$$\frac{x^2+4x-80}{-12} = \frac{-12y}{-12}$$

$$\boxed{y = -\frac{x^2}{12} - \frac{1}{3}x + \frac{20}{3}}$$



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

Question 35

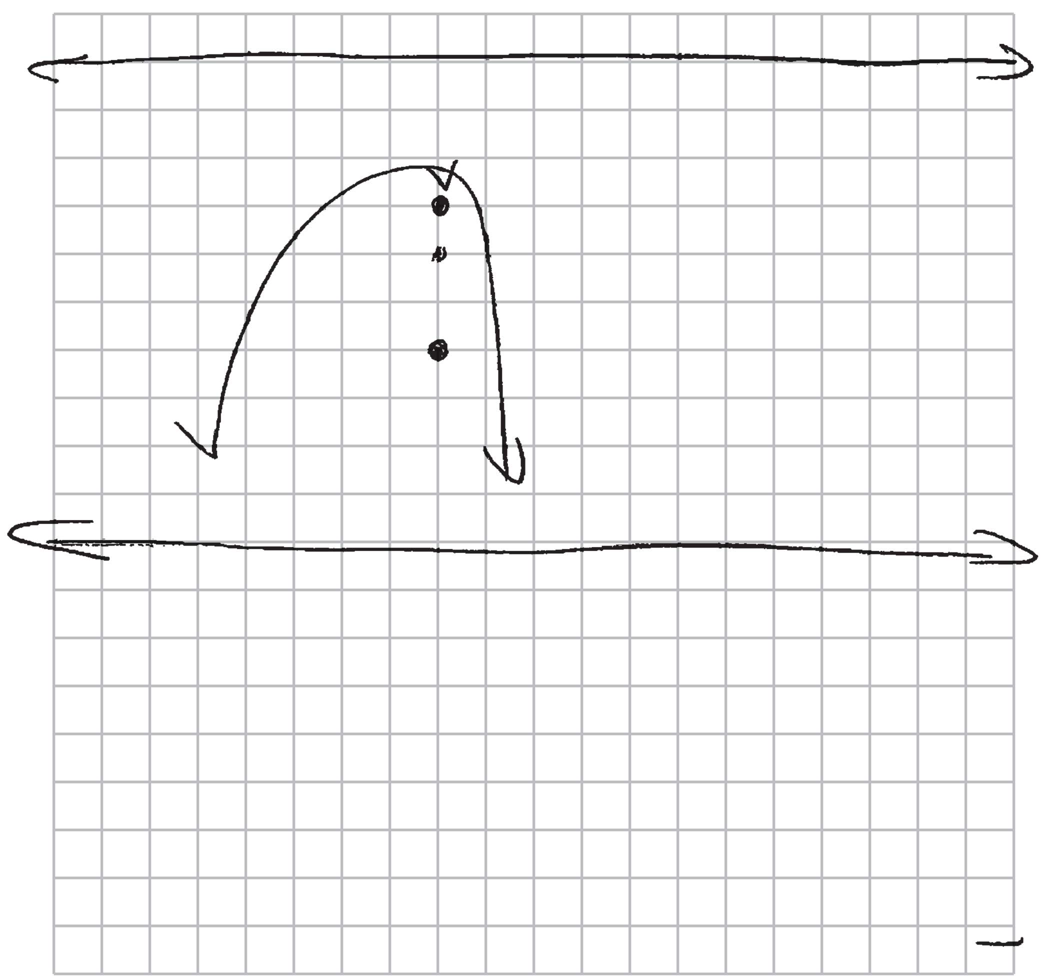
35 Determine an equation for the parabola with focus $(-2, 4)$ and directrix $y = 10$. (The use of the grid below is optional.)

$(-2, 7)$

3

$\frac{1}{4(3)}$

$$\boxed{y = -\frac{1}{7}(x+2)^2 + 7}$$



Score 3: The student made one computational error.

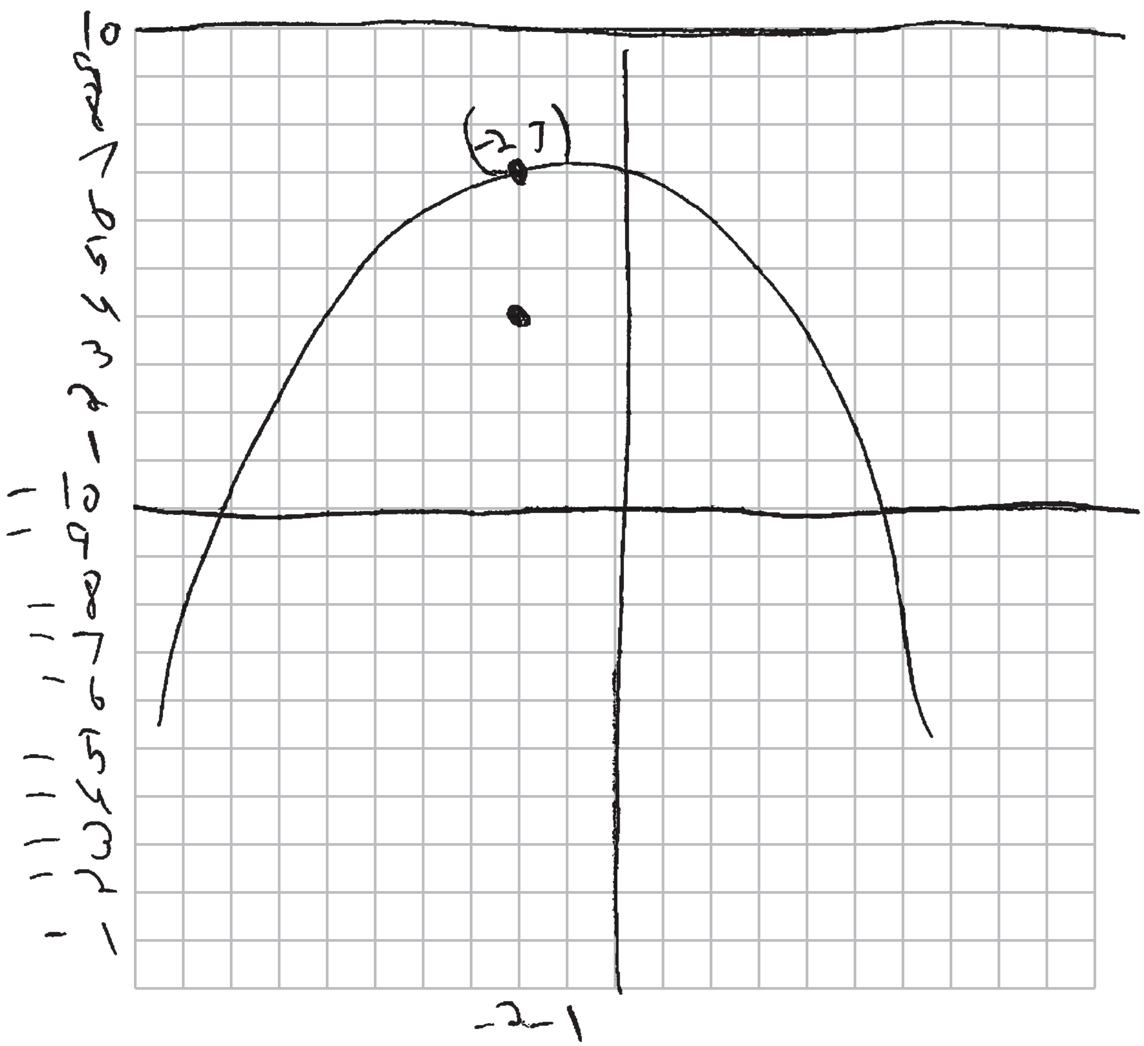
Question 35

35 Determine an equation for the parabola with focus $(-2, 4)$ and directrix $y = 10$. (The use of the grid below is optional.)

$$(x-h)^2 = 4(p)(y-k)$$

$$(x+2)^2 = 4(3)(y-7)$$

$$(x+2)^2 = 12(y-7)$$

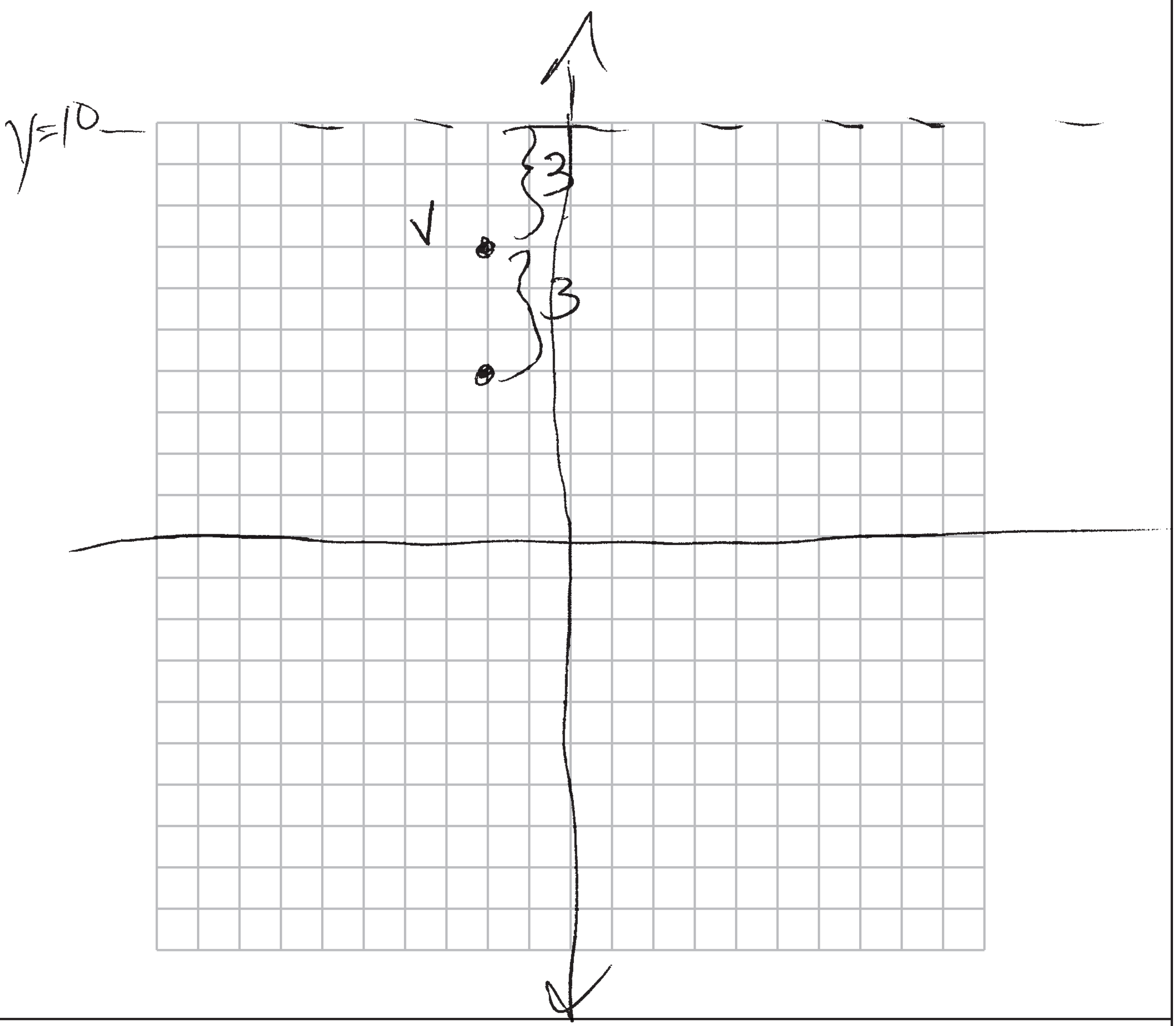


Score 3: The student made a sign error.

Question 35

35 Determine an equation for the parabola with focus $(-2, 4)$ and directrix $y = 10$.
(The use of the grid below is optional.)

$$(x+2)^2 = \frac{1}{3}(y-7)$$

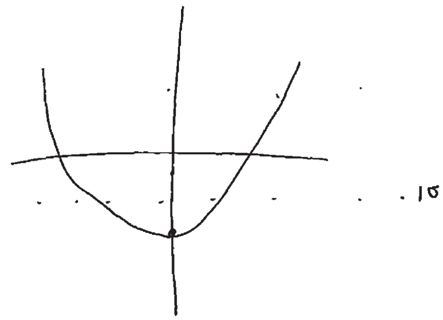


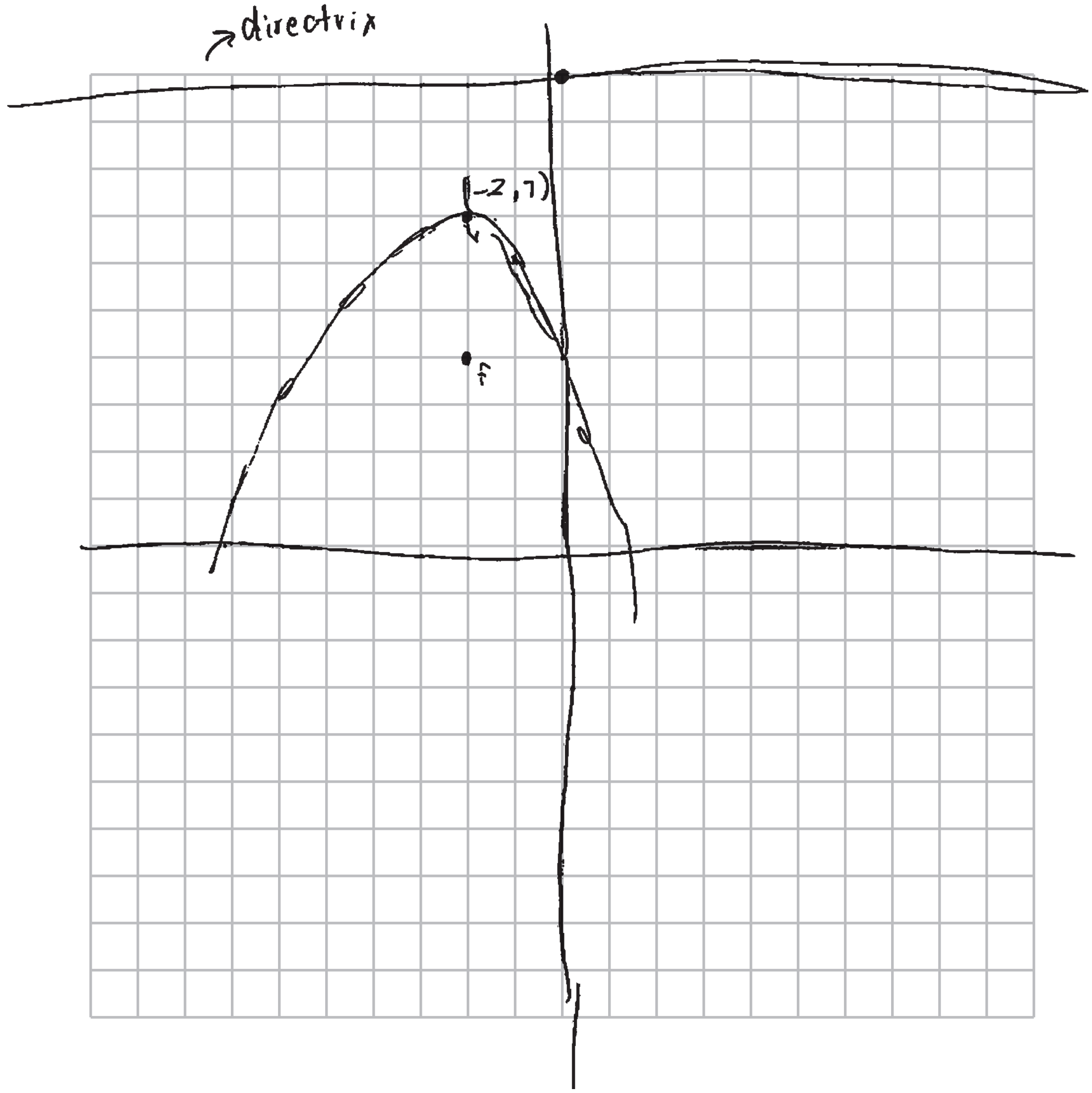
Score 2: The student made a conceptual error writing the equation.

Question 35

35 Determine an equation for the parabola with focus $(-2, 4)$ and directrix $y = 10$.
(The use of the grid below is optional.)

$f(x) = (x+2)^2 + (y-7)^2$





Score 1: The student correctly determined the vertex.

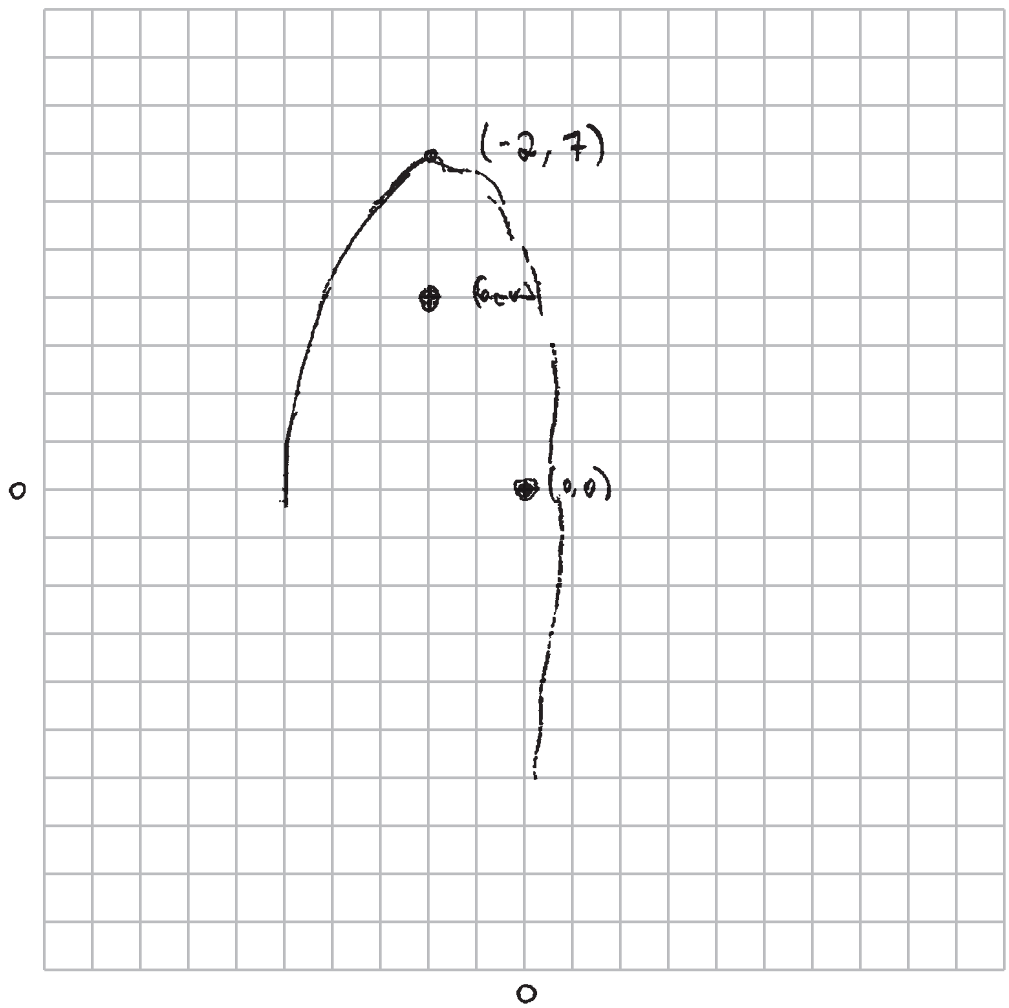
Question 35

35 Determine an equation for the parabola with focus $(-2, 4)$ and directrix $y = 10$. (The use of the grid below is optional.)

focus/directrix form

$$(x+2)^2 = (y+7)$$

directrix



Score 1: The student correctly determined the vertex.

Question 35

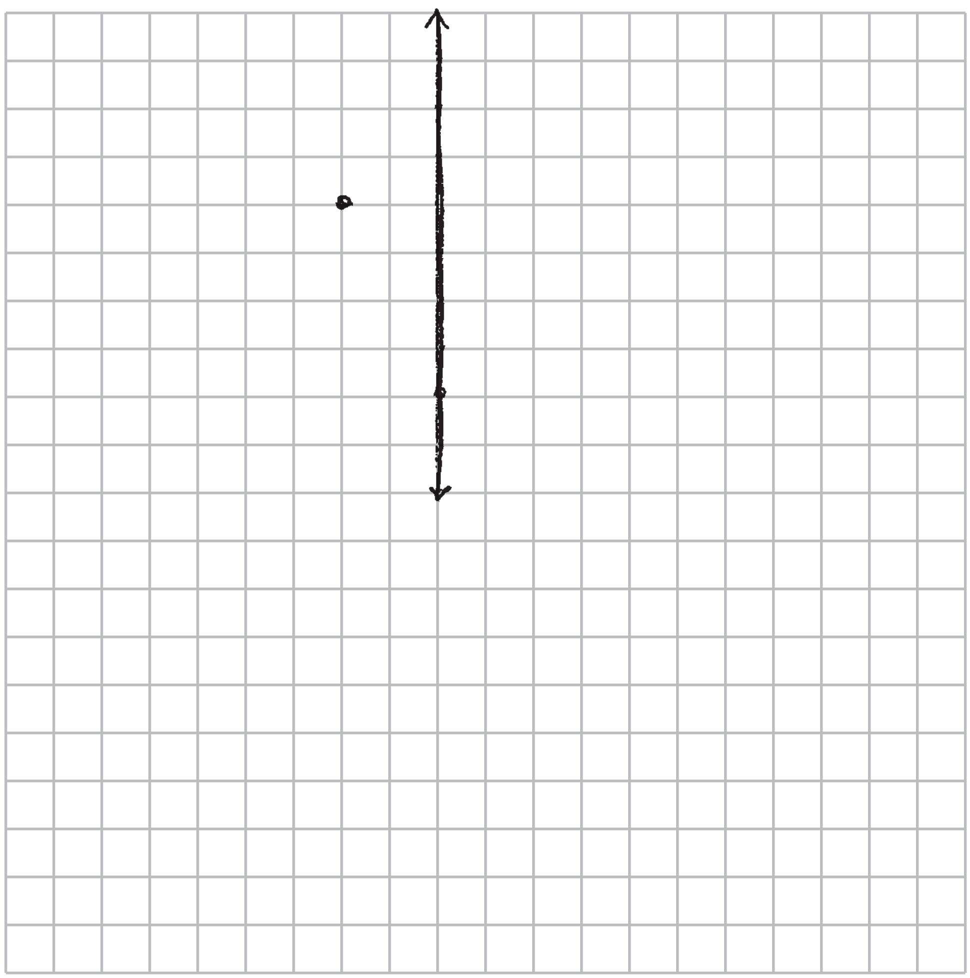
35 Determine an equation for the parabola with focus $(-2, 4)$ and directrix $y = 10$. (The use of the grid below is optional.)

$4p(y-k) = (x-h)^2$

$24(4-k) = (-2-h)^2$

$4 \cdot 6$

$10 - 4 = 6$



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

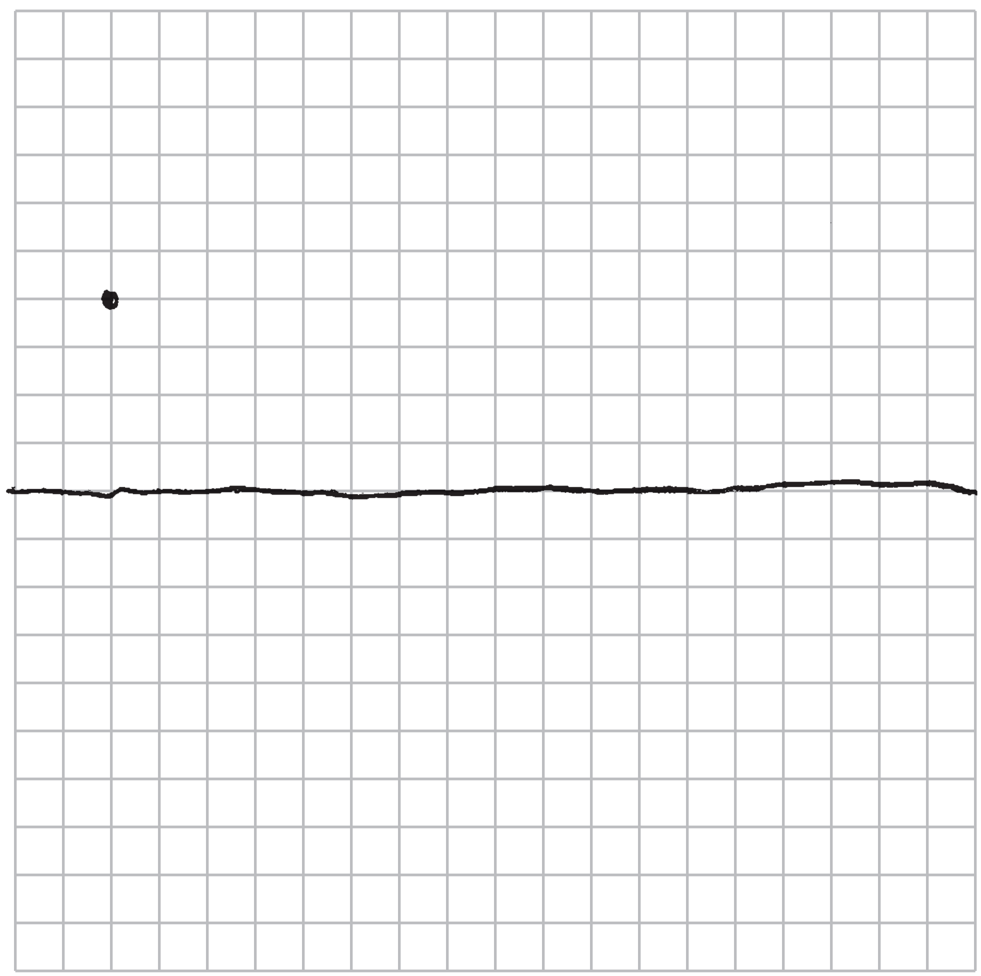
Question 35

35 Determine an equation for the parabola with focus $(-2, 4)$ and directrix $y = 10$. (The use of the grid below is optional.)

$$y = \frac{1}{4(10)}(x-2) + 4$$

$$y = \frac{1}{40}(x-2) + 4$$

$y = 10$



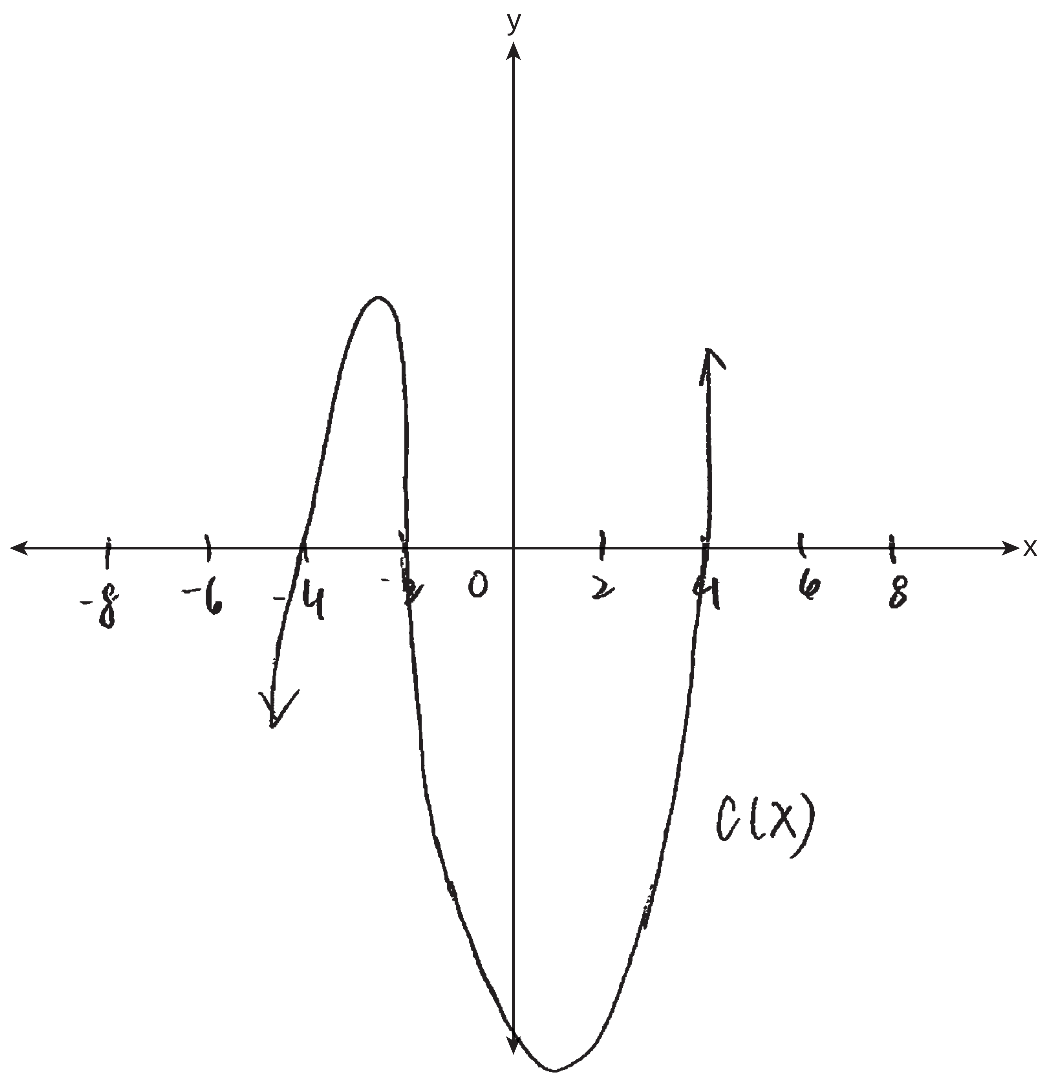
Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 36

36 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$.

$$x^2(x+2) - 16(x+2) = 0$$
$$(x^2 - 16)(x+2) = 0$$
$$(x-4)(x+4)(x+2) = 0$$
$$x = 4, -4, -2$$

On the axes below, sketch $y = c(x)$.



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

36 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$.

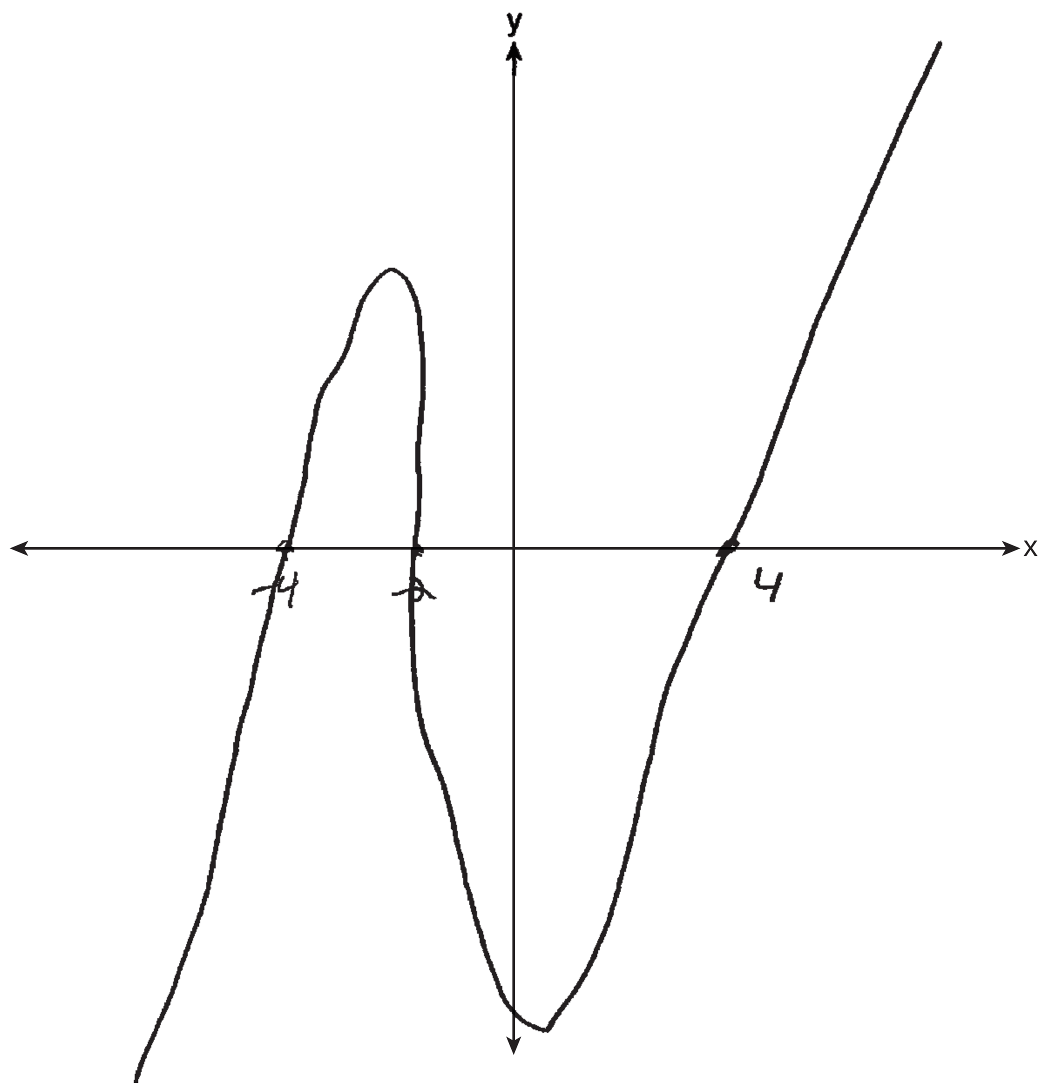
$x^2(x+2) - 16(x+2)$

$(x^2-16)(x+2)$

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

$\boxed{\begin{array}{l} x = 4 \\ x = -4 \\ x = -2 \end{array}}$

On the axes below, sketch $y = c(x)$.



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

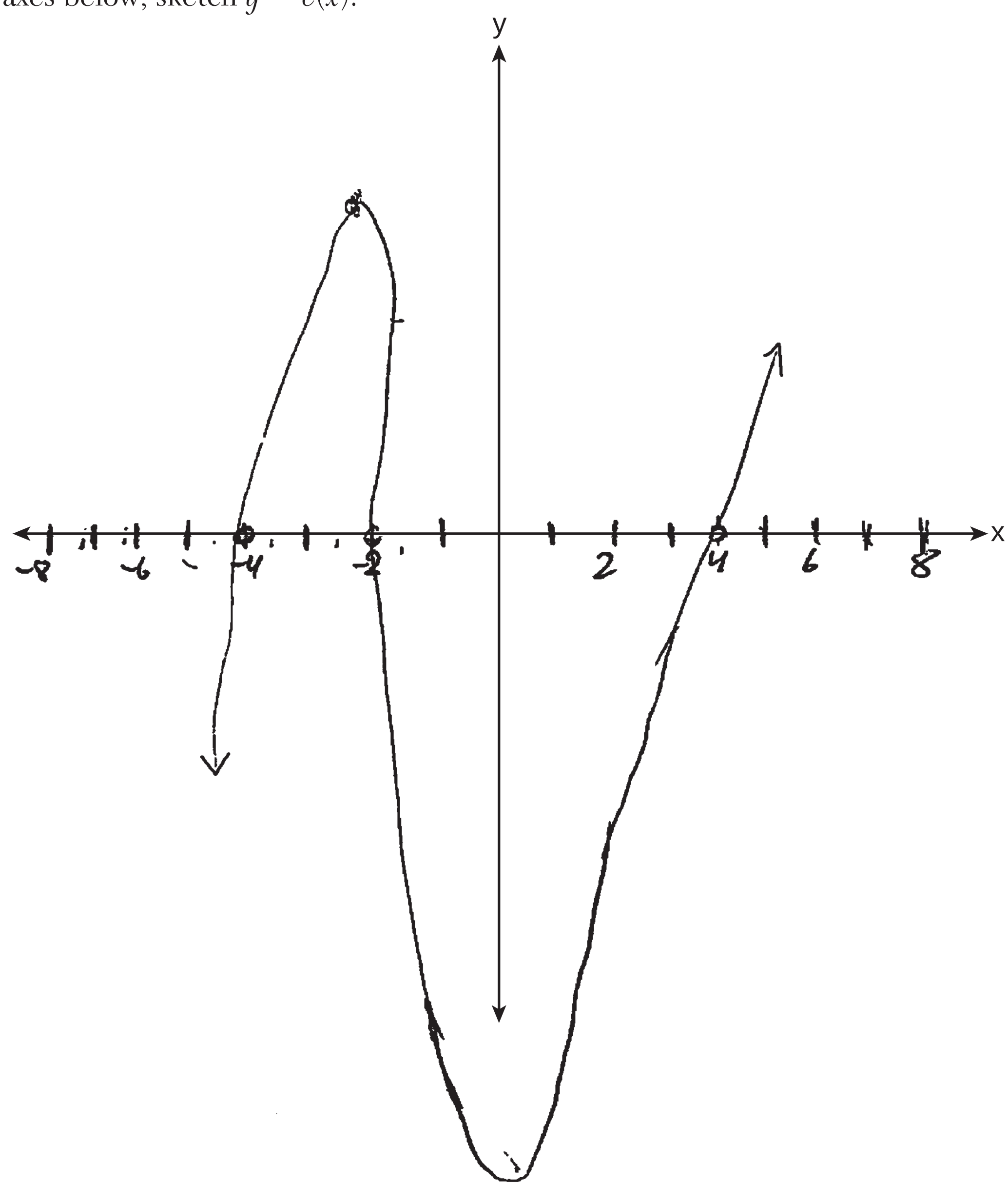
Question 36

36 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$.

$x = -2$
$x = \pm 4$

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

On the axes below, sketch $y = c(x)$.



Score 3: The student sketched the relative minimum incorrectly.

Question 36

36 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$.

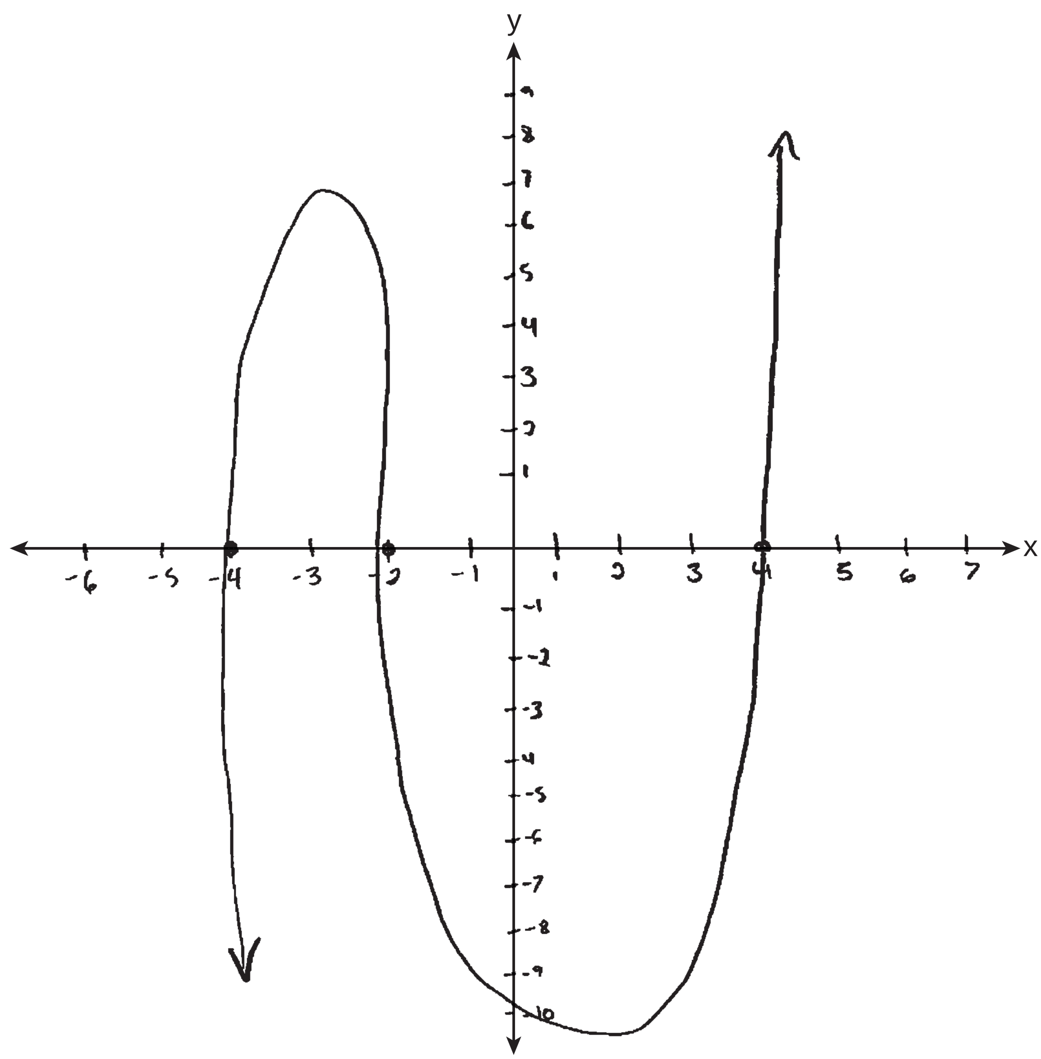
$x^2(x+2) - 16(x+2)$

$(x^2-16)(x+2)$

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

$x=4 \quad x=-4 \quad x=-2$

On the axes below, sketch $y = c(x)$.



Score 3: The student graphed an incorrect y-intercept.

Question 36

36 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$.

$x^3+2x \mid -16x-32$

$x(x^2+2) \mid -16(x+2)$

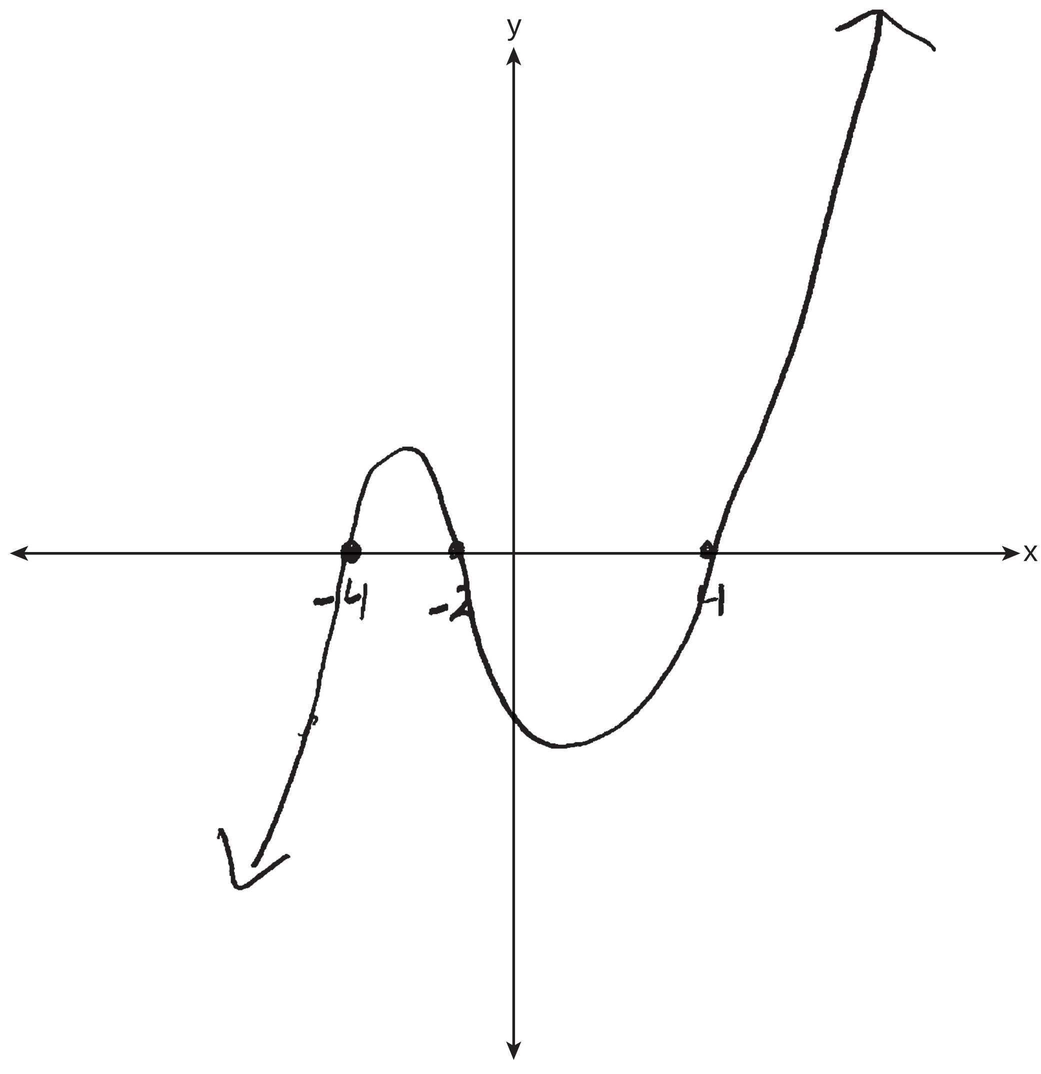
$x^2-2=6$

$+2 \quad +2$

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

$x=-2$

On the axes below, sketch $y = c(x)$.



Score 2: The student received two points for their graph.

Question 36

36 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$.

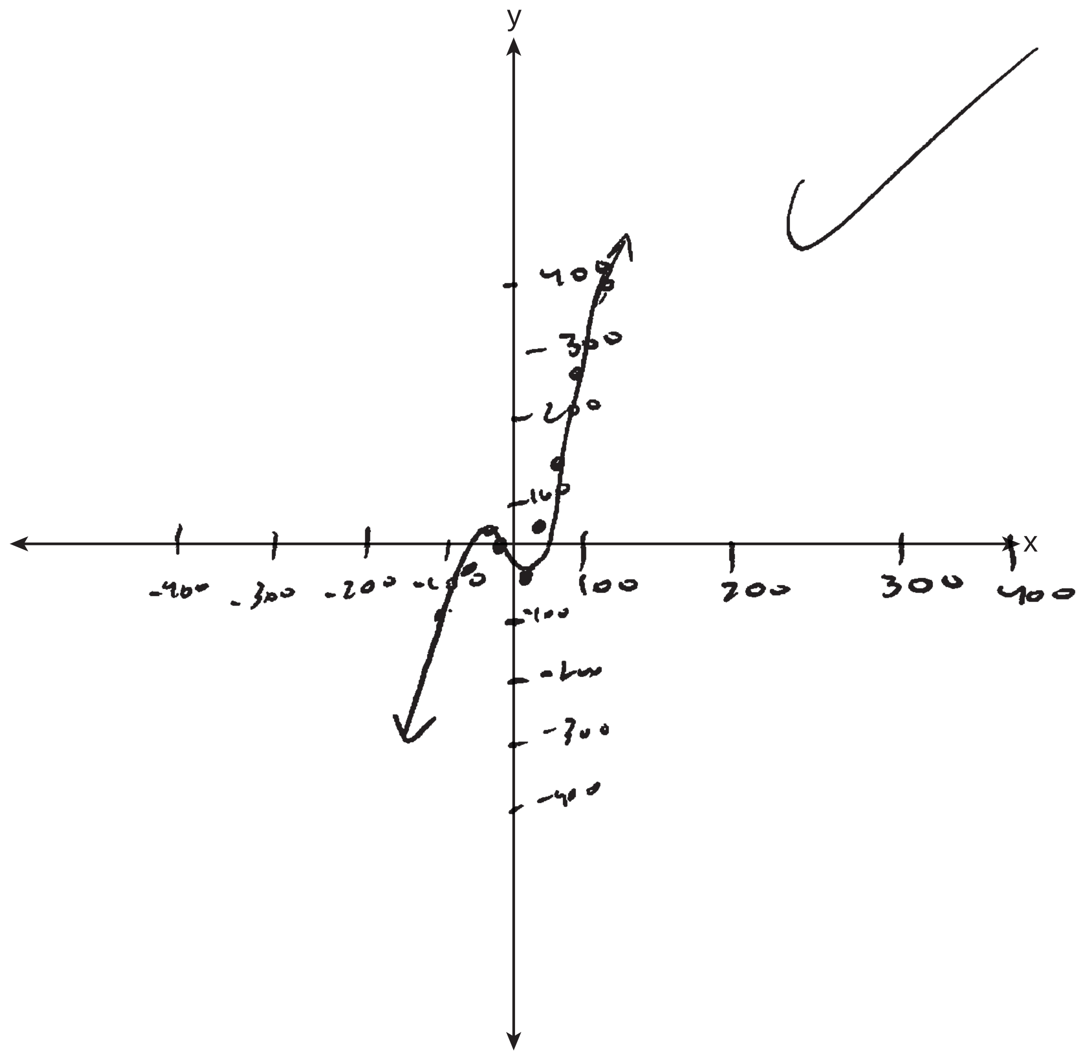
$c(x) = x^3 + 2x^2 - 16x - 32$

$c(x) = x^2(x+2) - 16(x+2)$

$c(x) = (x^2 - 16)(x+2)$

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

On the axes below, sketch $y = c(x)$.



Score 2: The student did not find the zeros, and the intercepts are not correct based on scale.

36 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$.

$(x^3+2x^2)(-16x-32)$

$x^2(x+2) - 16(x+2)$

$(x^2-16)(x+2)(x+2)$

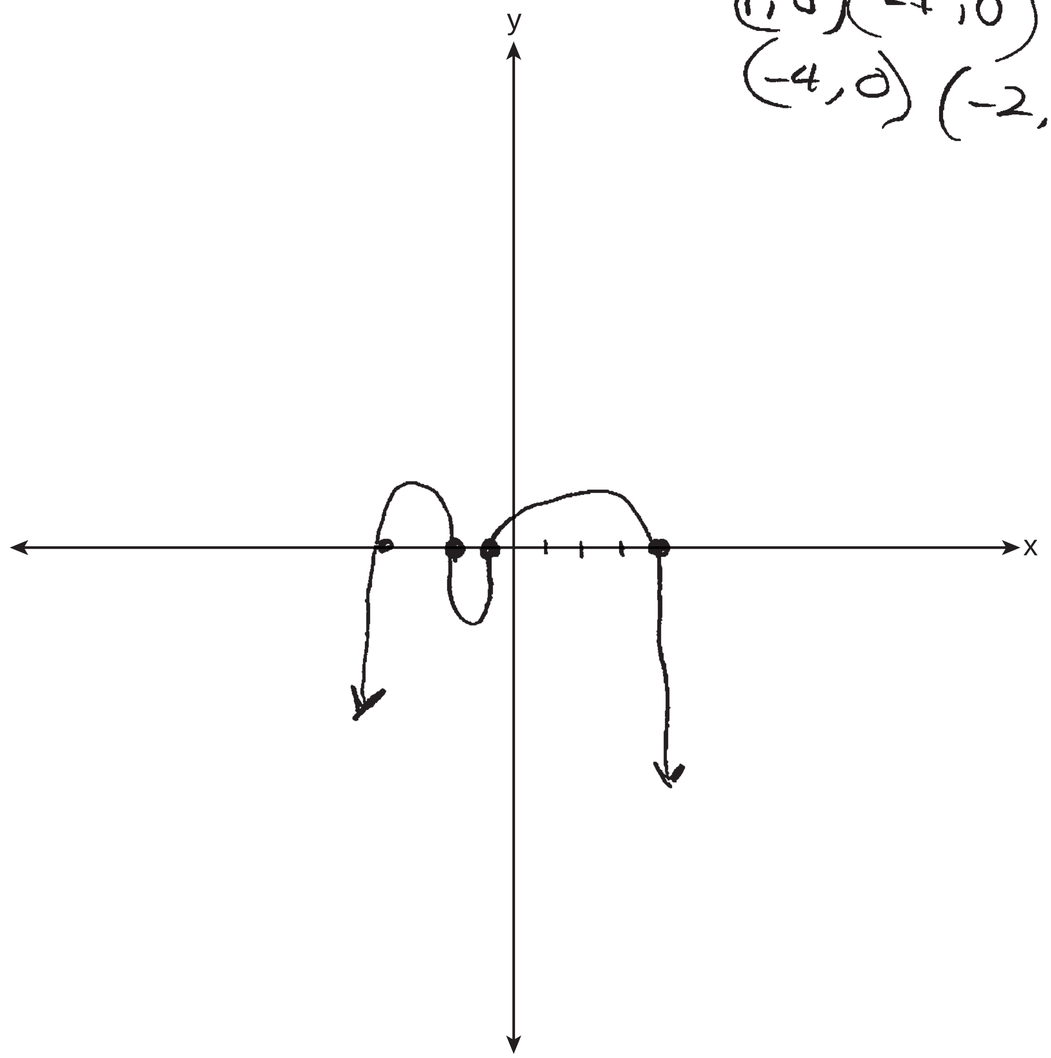
$(x+4)(x-4)(x+2)^2$

$x=-4$ $x=4$ $x=-2$

$(4,0)$ $(-4,0)$

$(-4,0)$ $(-2,0)$

On the axes below, sketch $y = c(x)$.



Score 1: The student made a factoring error in the first part and received no credit for the graph.

Question 36

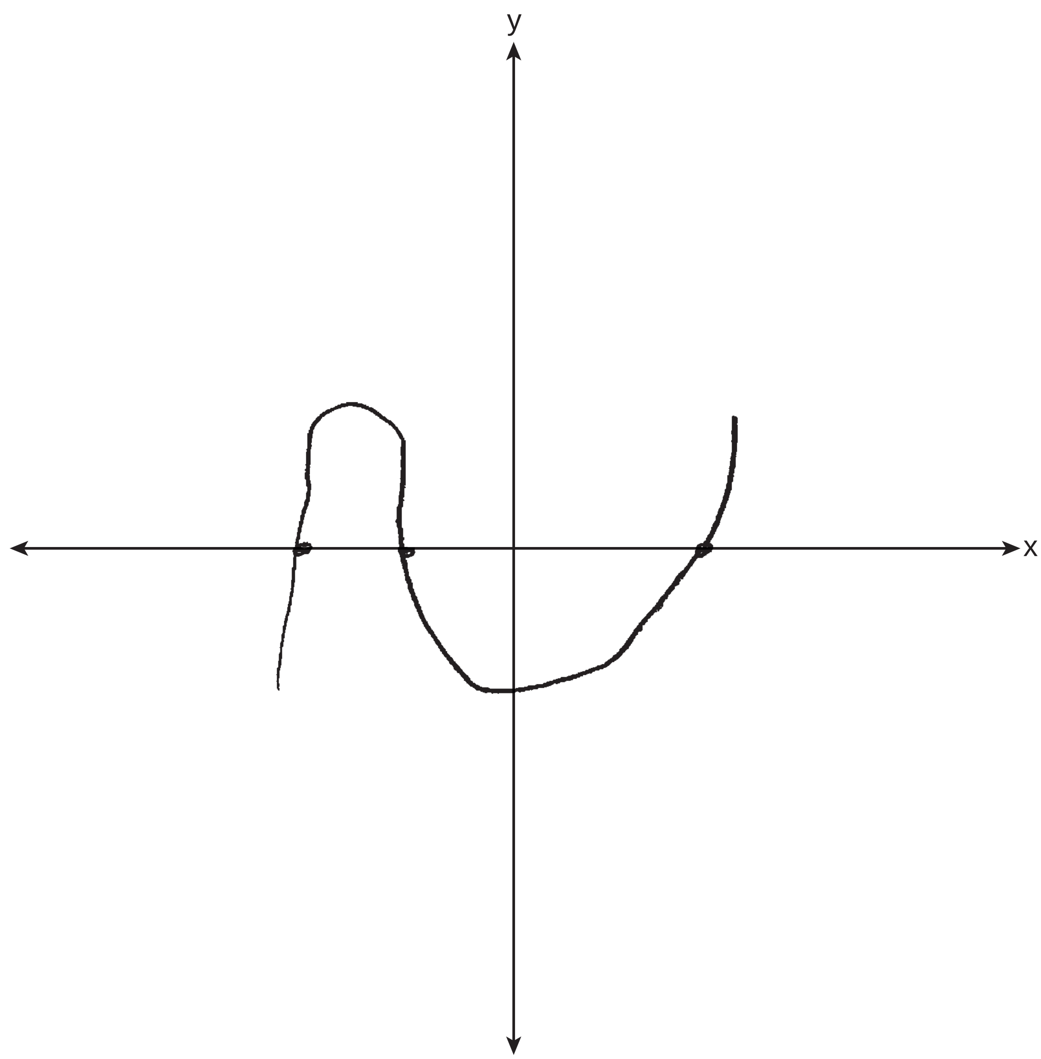
36 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$.

$x^2(x+2) - 16(x+2)$

$(x^2 - 16)(x+2)$

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

On the axes below, sketch $y = c(x)$.



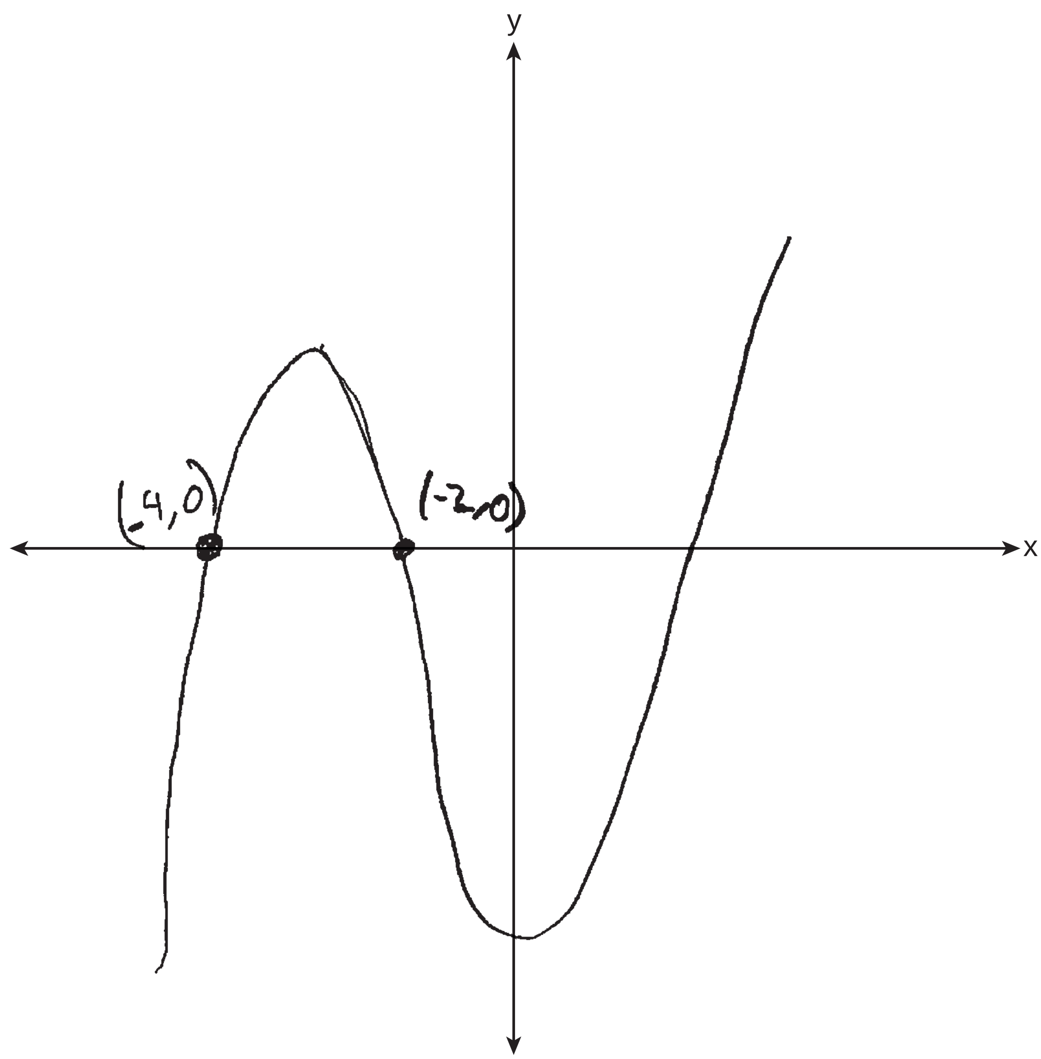
Score 1: The student received one point for factoring $c(x)$ correctly.

Question 36

36 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$.

$(-4, -2)$

On the axes below, sketch $y = c(x)$.



Score 0: The student response did not satisfy the criteria for one or more credits.

Question 36

36 Algebraically find the zeros of $c(x) = x^3 + 2x^2 - 16x - 32$.

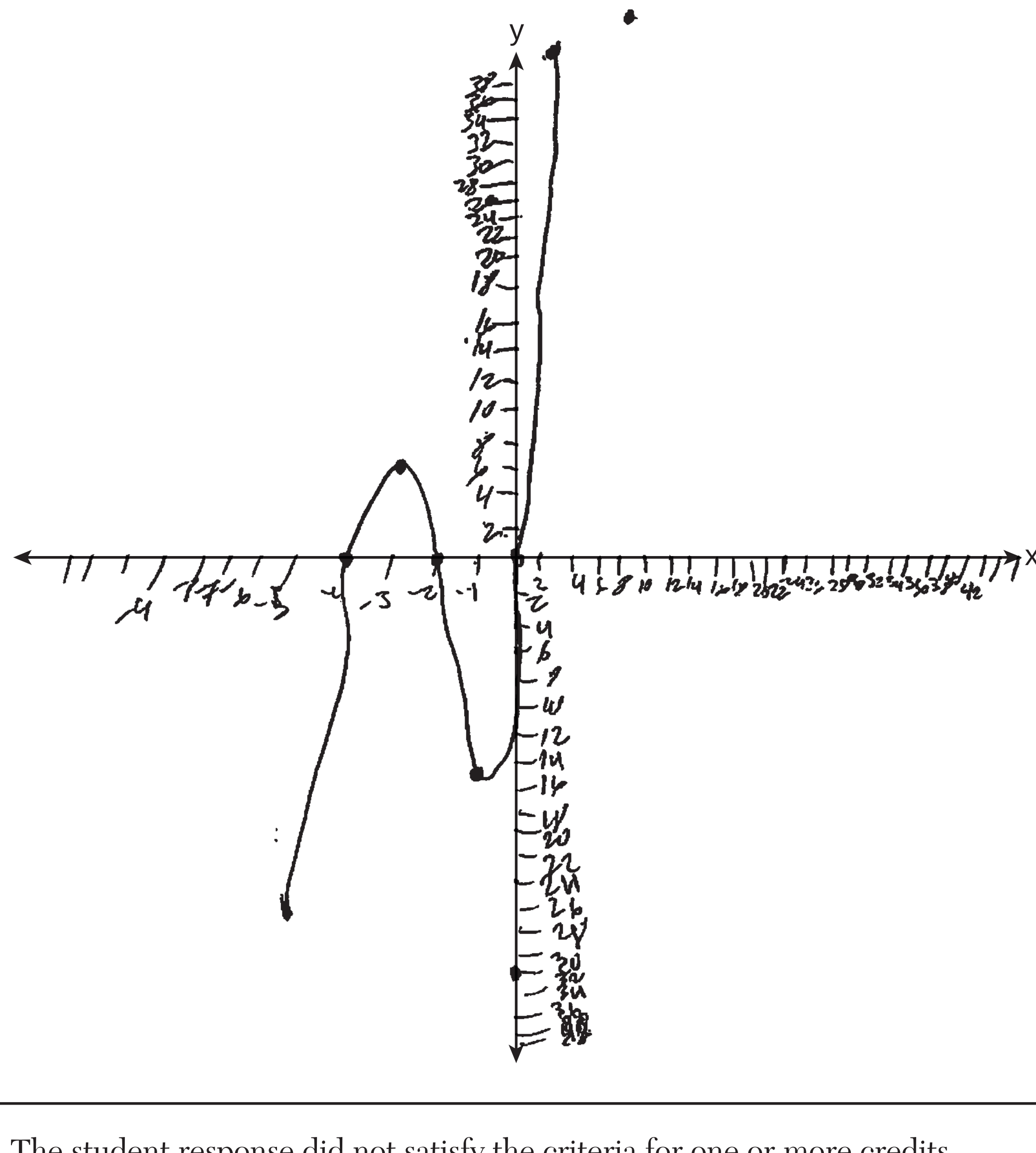
(0, -32)

(4, 0)

(-4, 0)

(-2, 0)

On the axes below, sketch $y = c(x)$.



Score 0: The student response did not satisfy the criteria for one or more credits.

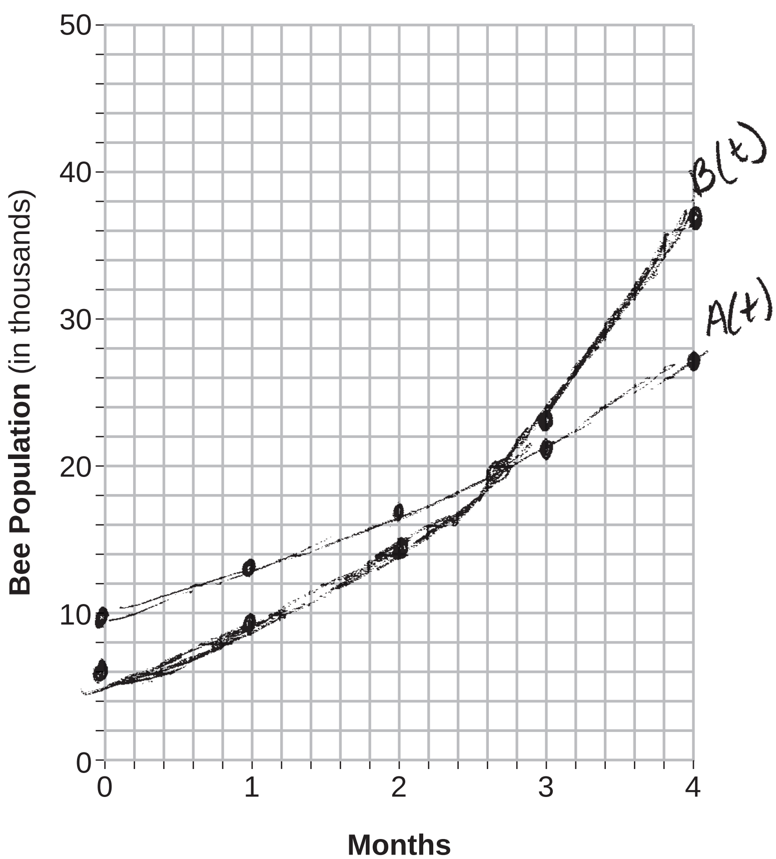
37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

$A(t)=10000e^{.25t}$ $B(t)=6000e^{.45t}$

Graph $A(t)$ and $B(t)$ for $0 \le t \le 4$.

t	$A(t)$
0	10000
1	12840
2	16487
3	21170
4	27183



t	$B(t)$
0	6000
1	9409.9
2	14758
3	23145
4	36298

Question 37 is continued on the next page.

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

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

2.6 months

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$$3 = e^{.25t}$$

$$\ln 3 = .25t$$

$$\frac{\ln 3}{.25} = t$$

$$t = 4.4$$

Question 37

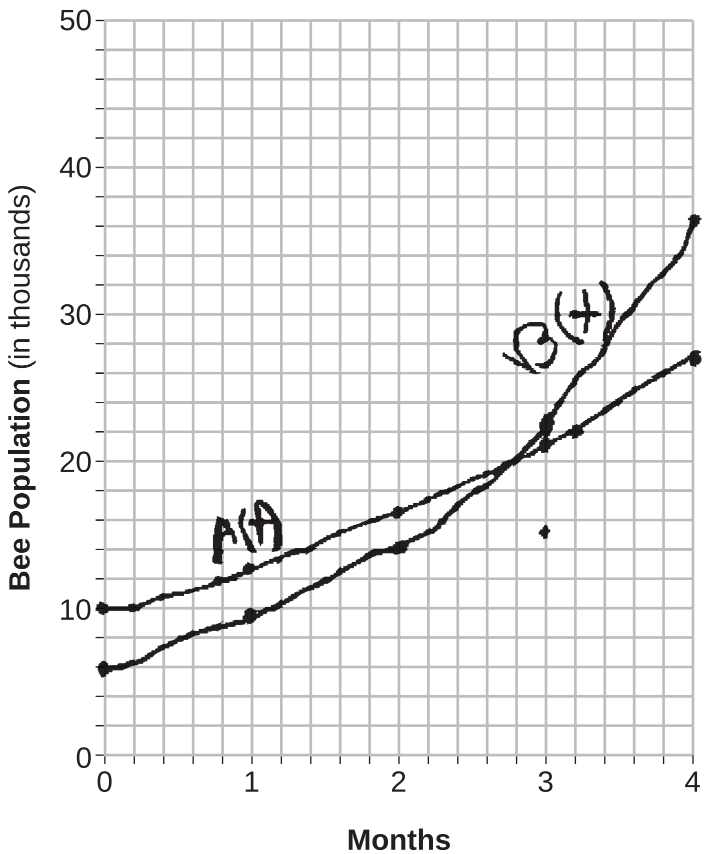
37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

$A(t) = 10000(e)^{.25t}$

$B(t) = 6000e^{.45t}$

Graph $A(t)$ and $B(t)$ for $0 \le t \le 4$.



Question 37 is continued on the next page.

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

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

2.6 months

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$$\frac{30000}{10000} = \frac{10000(e)^{.25t}}{10000}$$

$$3 = e^{.25t}$$

$$\frac{\ln 3}{\ln e} = 0.25t \frac{\ln e}{\ln e}$$

$$\ln 3 = \frac{0.25t}{0.25}$$

$$4.4 = t$$

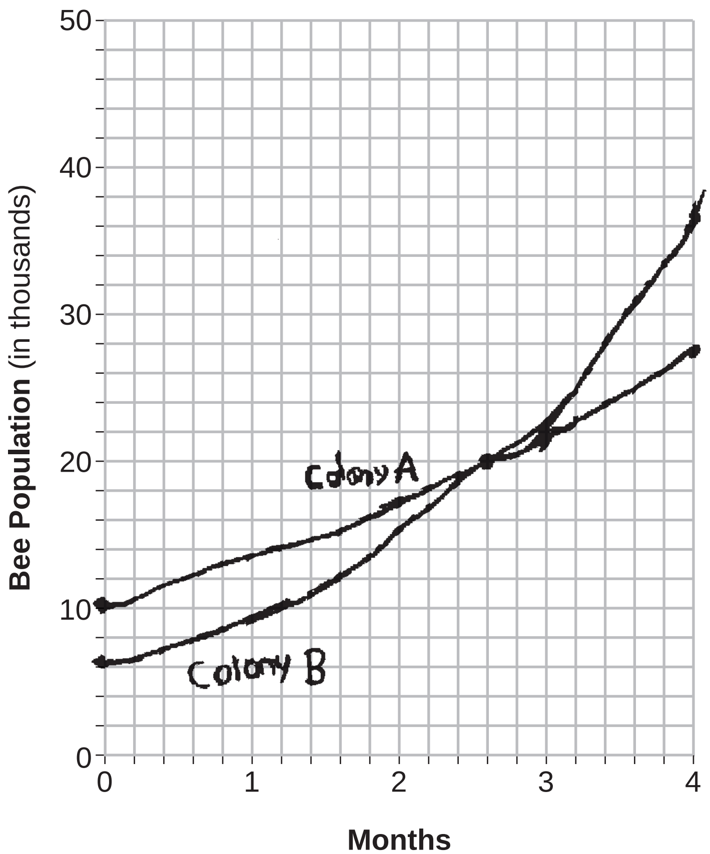
4.4 months

Question 37

37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

Graph $A(t)$ and $B(t)$ for $0 \leq t \leq 4$.



Question 37 is continued on the next page.

Score 5: The student did not write functions for $A(t)$ and $B(t)$.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

According to the Graph it will take 2.6 months
for the populations to be the same,

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$$\frac{30{,}000}{10000} = \frac{10{,}000e^{0.95t}}{10{,}000}$$

$$3 = e^{0.95t}$$

$$\frac{\ln(3)}{0.95} = \frac{0.95t}{0.95}$$

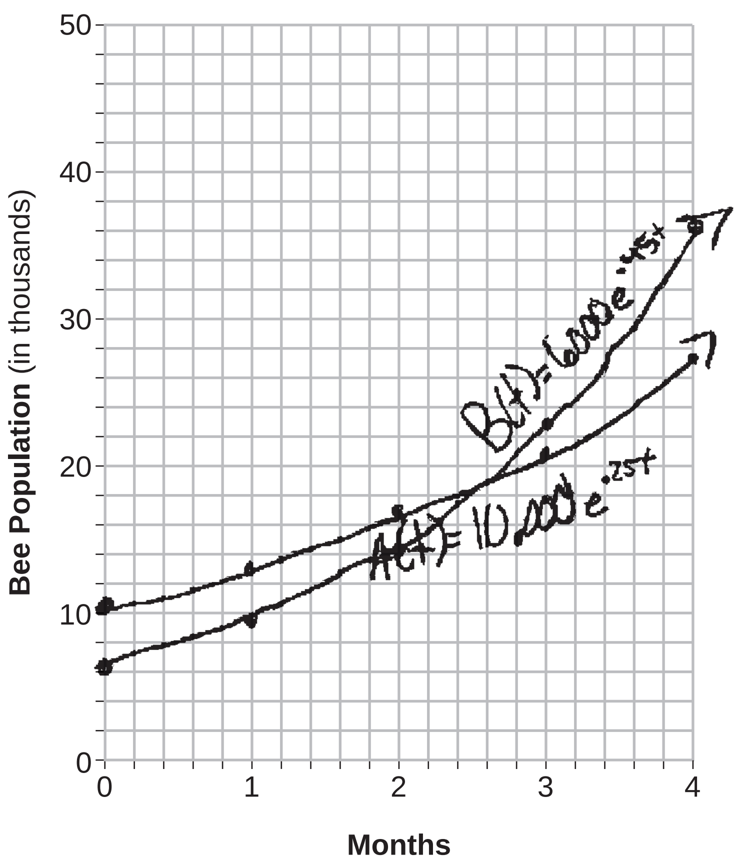
4.4 months

37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

$A(t) = 10{,}000e^{.25t}$ $\qquad$ $B(t) = 6000e^{.45t}$

Graph $A(t)$ and $B(t)$ for $0 \le t \le 4$.



Question 37 is continued on the next page.

Score 5: The student made a domain error when graphing the functions.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

2.6 months

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$30{,}000 = 10{,}000e^{.25t}$

$3 = e^{.25t}$

$\ln 3 = .25t$

$4.39 = t$

4.4 months

Question 37

37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

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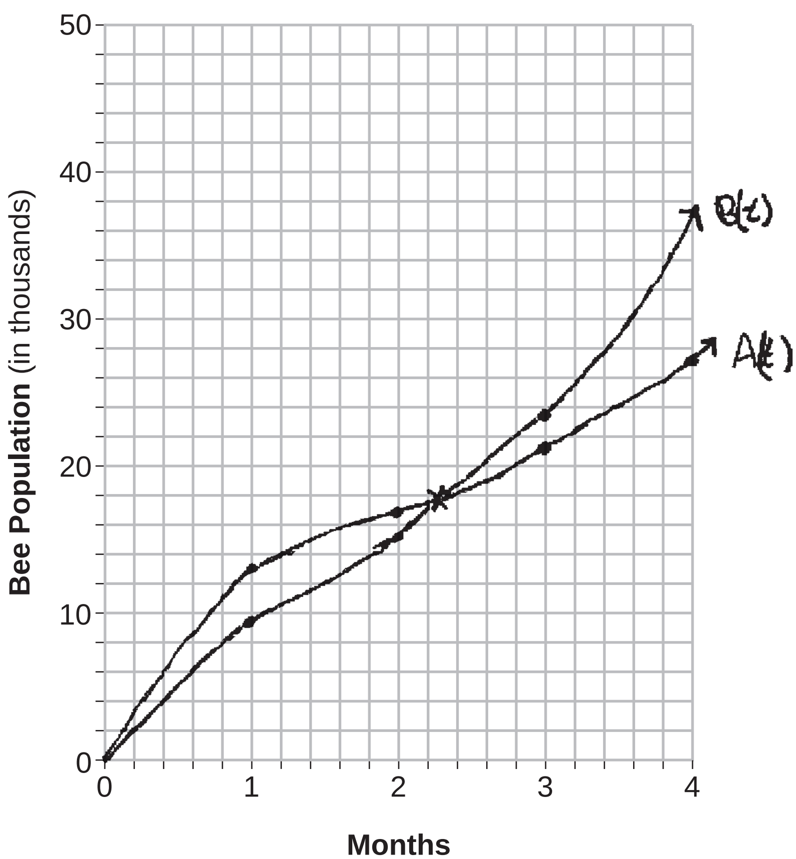
$A(t) = 10{,}000e^{0.25t}$

$B(t) = 6000e^{0.45t}$

Graph $A(t)$ and $B(t)$ for $0 \le t \le 4$.



Question 37 is continued on the next page.

Score 4: The student made two graphing errors, but determined 2.3 months correctly based on their graph.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

$10{,}000e^{0.28t} = 6000e^{0.45t}$

$\boxed{t = 2.3 \text{ months.}}$

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$\frac{30{,}000}{10{,}000} = \frac{10{,}000e^{0.28t}}{10{,}000}$

$\ln(3 = \ln e^{0.25t}$

$\frac{1.0986}{0.25} = \frac{0.25t}{0.25}$

$\boxed{4.4 \text{ months} = t}$

Question 37

37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

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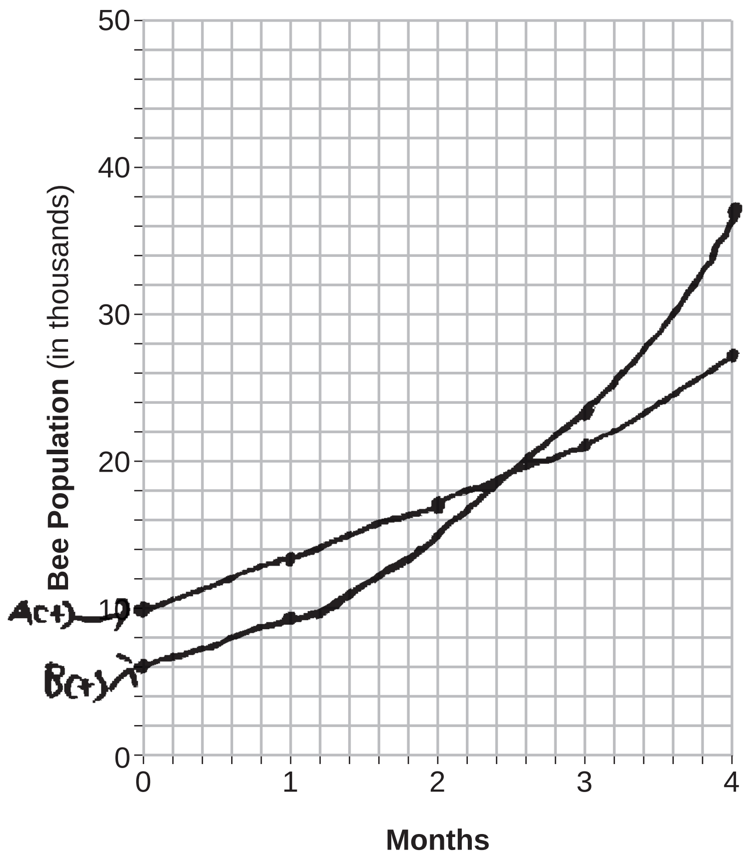
$A(t) = 10{,}000e^{.25t}$

$B(t) = 6{,}000e^{.45t}$

Graph $A(t)$ and $B(t)$ for $0 \le t \le 4$.



Question 37 is continued on the next page.

Score 4: The student did not determine $A(t) = B(t)$ and used Colony B in the last part.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

$$\frac{10{,}000e^{.25t}}{6000} = \frac{6000e^{.45t}}{6000} \qquad \frac{5}{3}e^{.25t} = e^{.45t}$$

$$\frac{5}{3} ~~\ln e~~ .25t$$

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$$\frac{18{,}000}{6000} = \frac{6000e^{.45t}}{6000}$$

$$3 = e^{.45t}$$

$$\frac{\ln(3)}{.45} = \frac{.45t}{.45} ~~\ln e~~$$

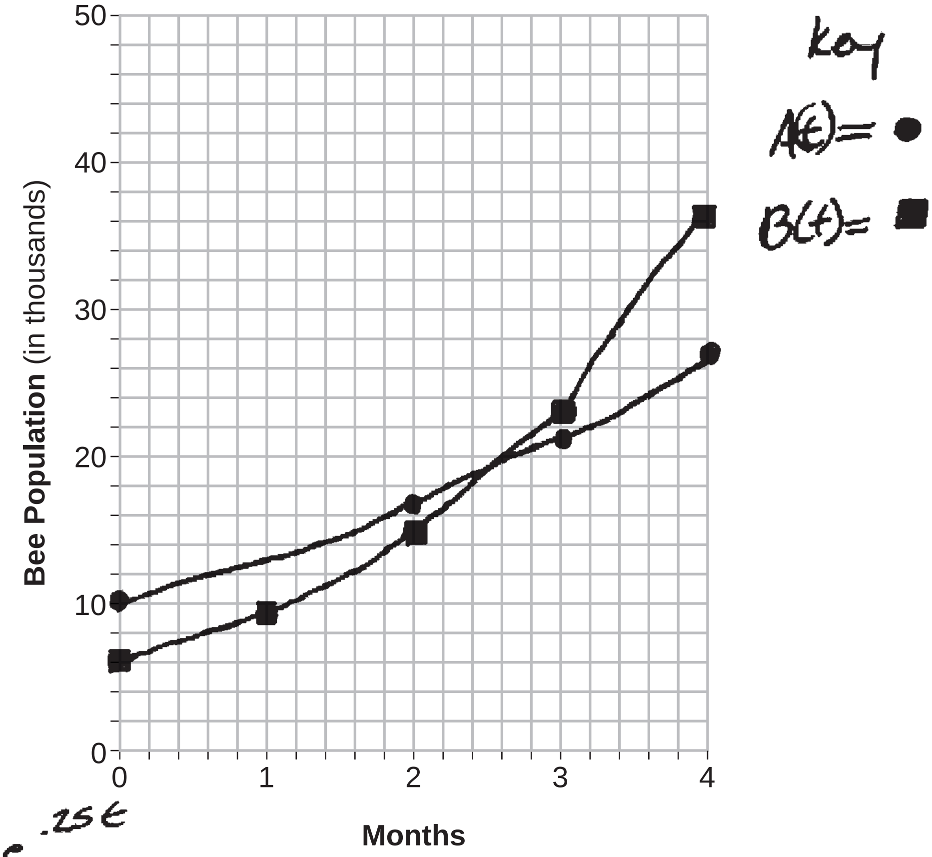
$t = 2.4$ months

Question 37

37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

Graph $A(t)$ and $B(t)$ for $0 \leq t \leq 4$.



$A(t) = 10000e^{.25t}$

$B(t) = 6000e^{.45t}$

Question 37 is continued on the next page.

Score 3: The student received no credit for the last two parts.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$$30{,}000 = \frac{10{,}000e^{.25x}}{10000}$$

$$3 = e^{.25x}$$

Question 37

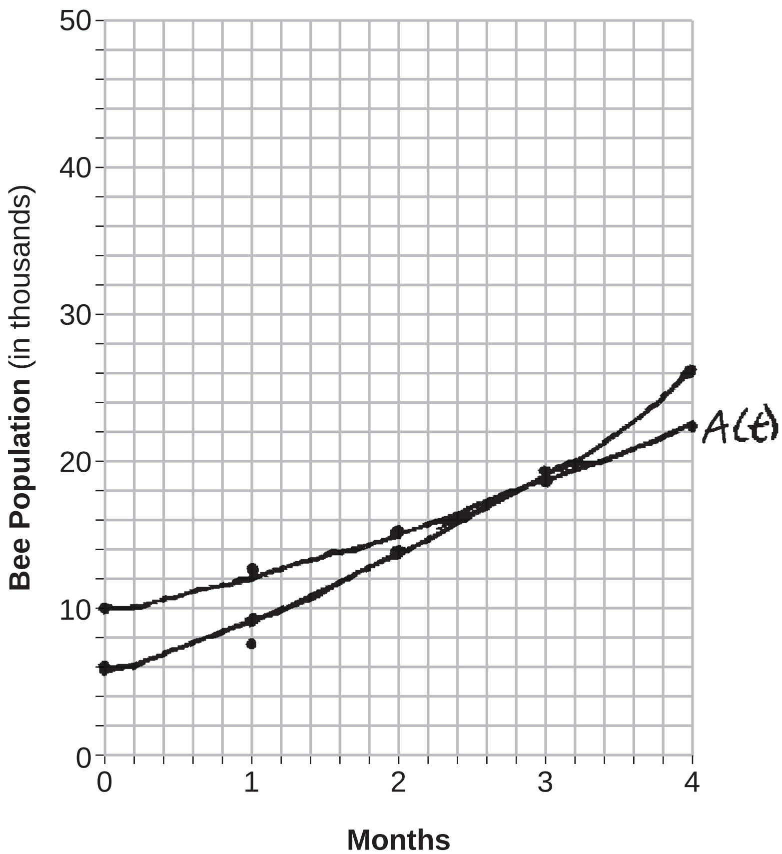
37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

$A(t) = 10000 \cdot 1.25^t$

$B(t) = 6000 \cdot 1.45^t$

Graph $A(t)$ and $B(t)$ for $0 \leq t \leq 4$.



Question 37 is continued on the next page.

Score 3: The student wrote incorrect equations, graphed $A(t)$ incorrectly, and rounded incorrectly in the third part.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

$10000 \cdot 1.25^t = 6000 \cdot 1.45^t$

$1.667 \cdot 1.25^t = \frac{1.45^t}{1.25^t}$

$1.667 = 1.16^t$

$\log_{1.16}(1.667) = t$

$t = 3.44$ months

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$30000 = 10000\ 1.25^t$

$3 = 1.25^t$

$t = \log_{1.25}(3)$

$t = 4.9$ months

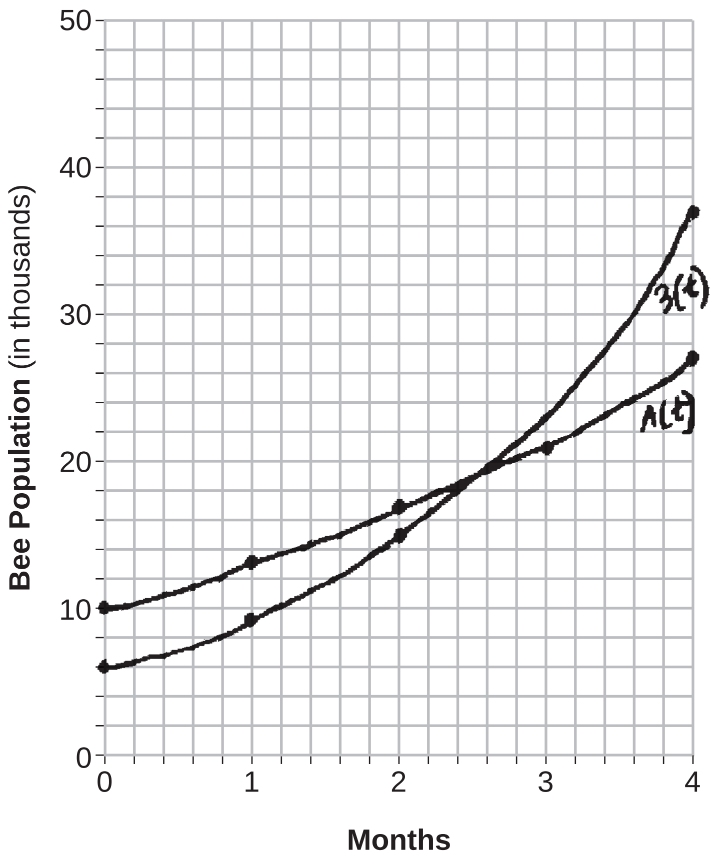
Question 37

37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

A - 10,000

Graph $A(t)$ and $B(t)$ for $0 \le t \le 4$.



Question 37 is continued on the next page.

Score 2: The student received two points for the graph.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

4.5

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$10000e^{.25(t)} =$

$10000e^{.25(4.5)} = 30802.16$

4.5 months

Question 37

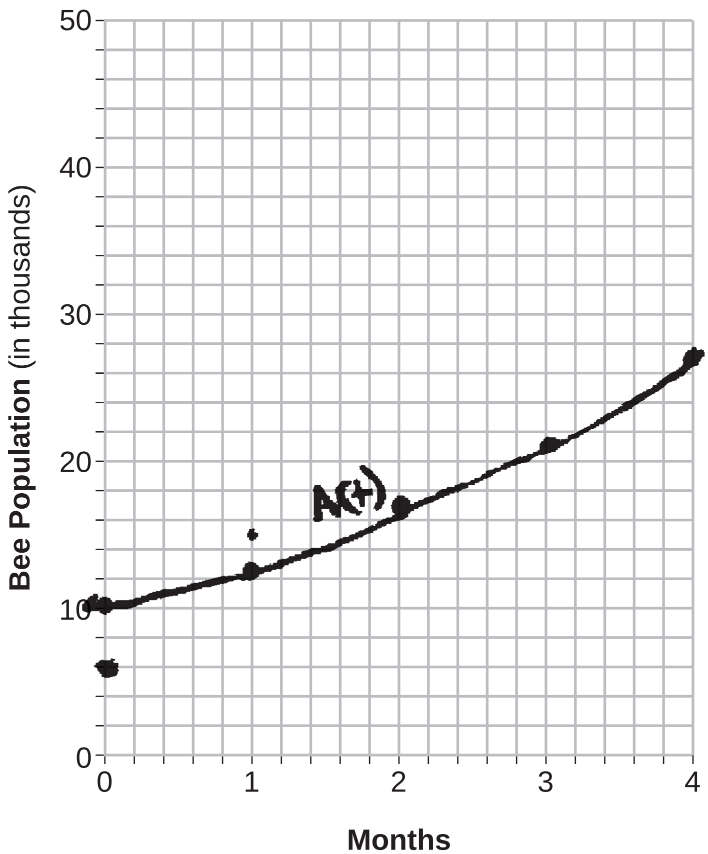
37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

$10000e^{0.25t} = A(t)$

$B(t) = 6000e^{0.45t}$

Graph $A(t)$ and $B(t)$ for $0 \le t \le 4$.



Question 37 is continued on the next page.

Score 2: The student received one point for the equations and one point for the graph.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

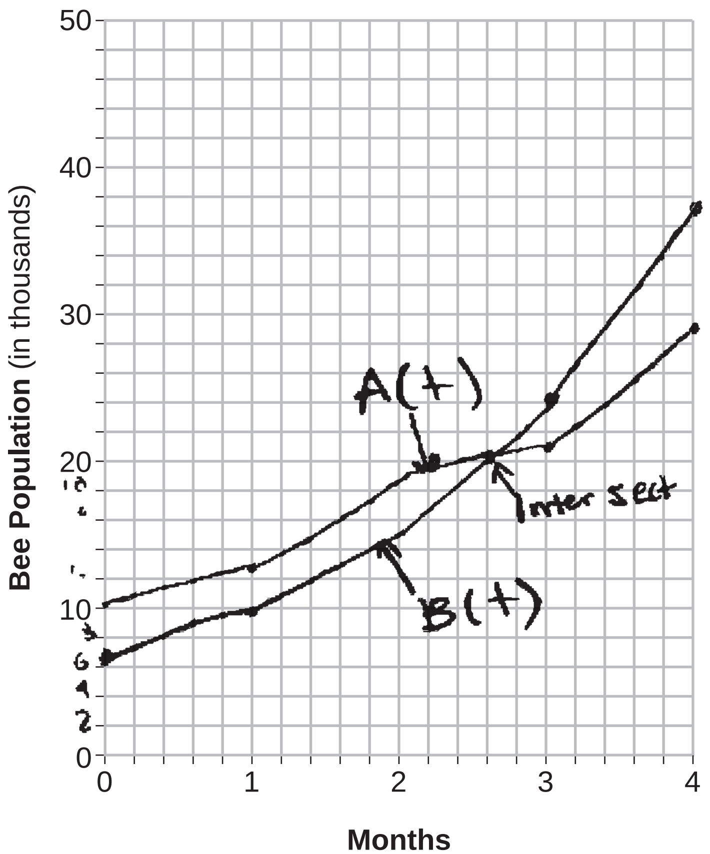
37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

$A(t) = P_{10,000}e^{0\,25t}$

$B(t) = P_{6,000}e^{0\,45t}$

Graph $A(t)$ and $B(t)$ for $0 \leq t \leq 4$.



Question 37 is continued on the next page.

Score 1: The student received one point for graphing $B(t)$ correctly.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

In 2 months time

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$0.25(5t) = 1.25$

$10{,}000e^{1.25} = 34{,}903$

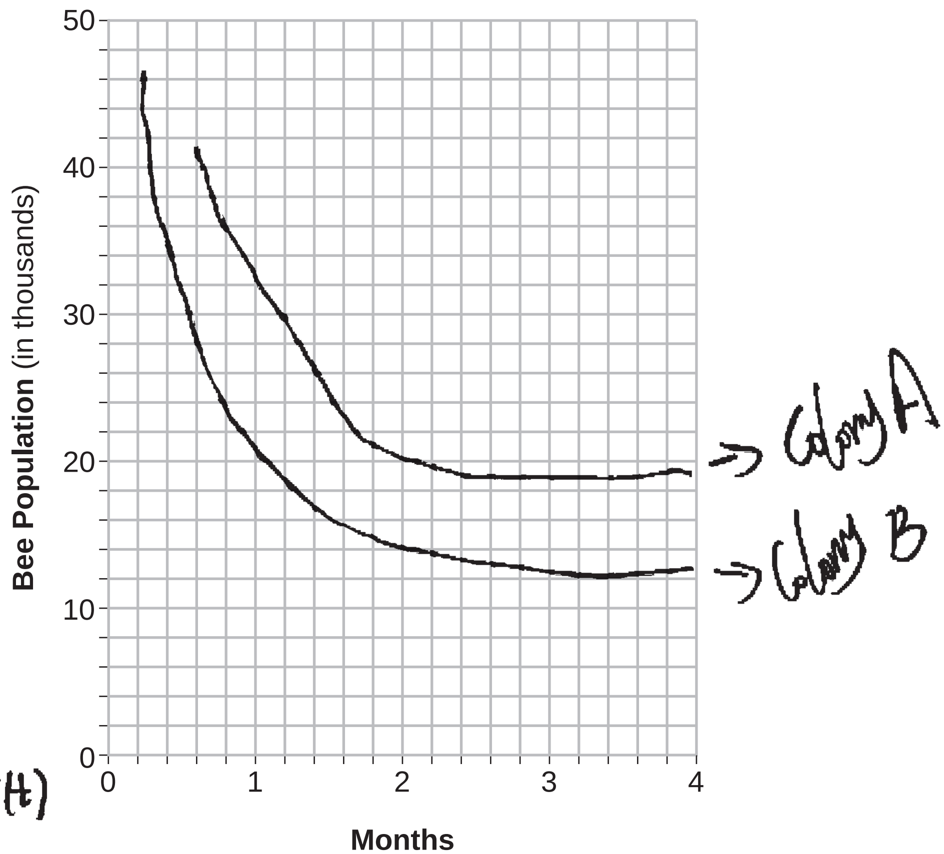
it will take 5 months for the population to triple.

Question 37

37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

Graph $A(t)$ and $B(t)$ for $0 \leq t \leq 4$.



$A(t) = 10{,}000e^{0.25(t)}$

$B(t) = 6000e^{0.45(t)}$

Question 37 is continued on the next page.

Score 1: The student received one point for writing functions for $A(t)$ and $B(t)$.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony A to triple.

Question 37

37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

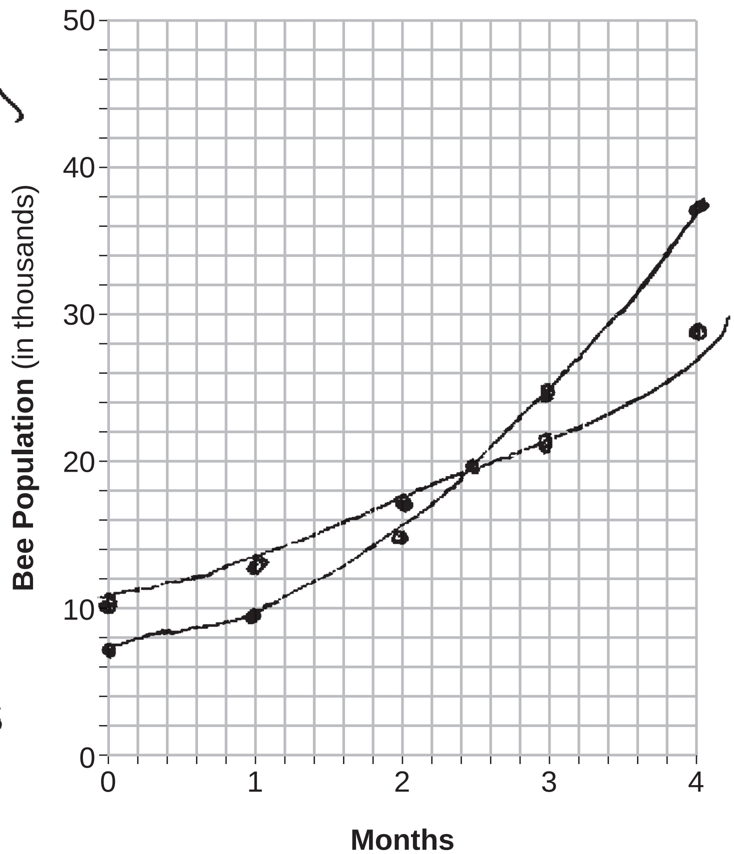
Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

$A(t) = 10{,}000pe^{.25t}$
$B(t) = 6{,}000pe^{45t}$

Graph $A(t)$ and $B(t)$ for $0 \le t \le 4$.

X	Y A(T)
0	10,000
1	12846
2	16487
3	21170
4	27183

X	Y B(T)
0	6,000
1	9409
2	1475
3	23145
4	36298



Question 37 is continued on the next page.

Score 0: The student response did not satisfy the criteria for one or more credits.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

The colonies will have the same population in 3 months.

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$3^3 = 27$

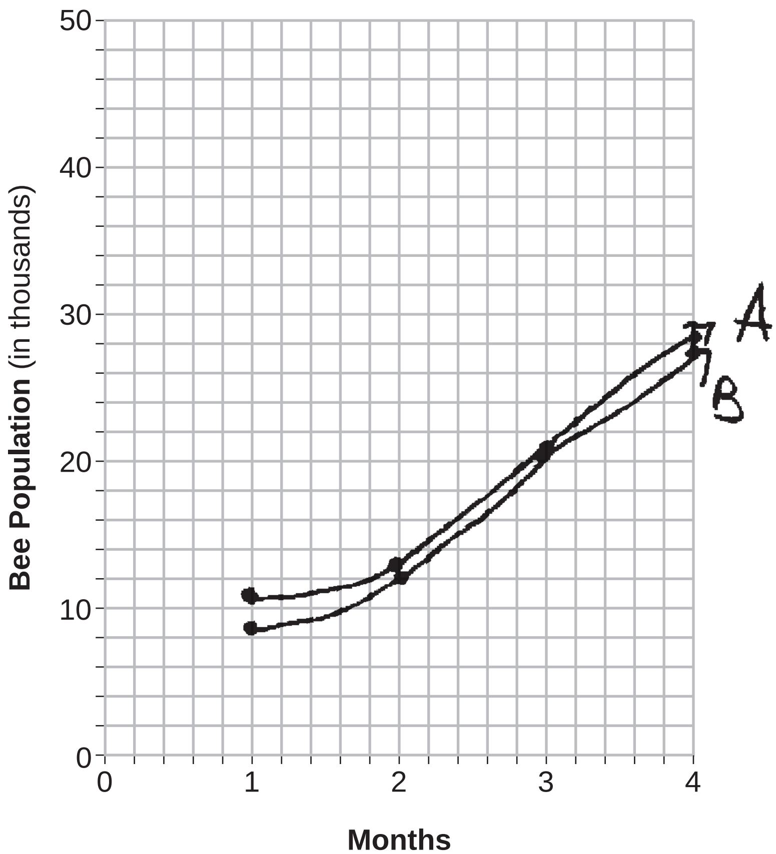
It will take Colony A three months to triple.

37 The populations of honeybees in two different colonies are studied for four months. During this time, the colony population can be approximated by $P(t) = P_0e^{rt}$, where $P(t)$ is the colony population of bees at t months, P_0 is the initial population, and r is the growth rate.

Colony A has an initial population of 10,000 bees and a continuous growth rate of 0.25. Colony B has an initial population of 6000 bees and a continuous growth rate of 0.45. Write functions for both $A(t)$ and $B(t)$ that model the honeybee populations of the colonies after t months.

$10{,}000e^{0.25t}$ $6000e^{0.45t}$

Graph $A(t)$ and $B(t)$ for $0 \le t \le 4$.



Question 37 is continued on the next page.

Score 0: The student response did not satisfy the criteria for one or more credits.

Question 37

State, to the *nearest tenth of a month*, when the colonies will have the same population.

Determine algebraically how long it will take, to *the nearest tenth of a month*, for the population in Colony *A* to triple.

$$\frac{30{,}000 = 10{,}000}{10{,}000} e^{0.25t}$$

$$\ln(3) = \ln(e^{0.25t})$$

$$\frac{\ln(3) = 0.25}{0.25} \ln t$$

$$t = 12$$

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

Regents Examination in Algebra II – January 2025

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

(Use for the January 2025 exam only.)

Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level
86	**100**	5	57	**81**	4	28	**65**	3
85	**99**	5	56	**80**	4	27	**64**	2
84	**97**	5	55	**80**	4	26	**63**	2
83	**96**	5	54	**80**	4	25	**62**	2
82	**95**	5	53	**79**	4	24	**60**	2
81	**94**	5	52	**79**	4	23	**59**	2
80	**94**	5	51	**79**	4	22	**57**	2
79	**93**	5	50	**78**	4	21	**55**	2
78	**92**	5	49	**78**	4	20	**54**	1
77	**91**	5	48	**78**	4	19	**53**	1
76	**90**	5	47	**77**	3	18	**51**	1
75	**90**	5	46	**77**	3	17	**49**	1
74	**89**	5	45	**77**	3	16	**47**	1
73	**88**	5	44	**76**	3	15	**45**	1
72	**88**	5	43	**76**	3	14	**42**	1
71	**87**	5	42	**75**	3	13	**40**	1
70	**87**	5	41	**75**	3	12	**37**	1
69	**86**	5	40	**74**	3	11	**35**	1
68	**86**	5	39	**74**	3	10	**32**	1
67	**85**	5	38	**73**	3	9	**29**	1
66	**84**	4	37	**73**	3	8	**27**	1
65	**84**	4	36	**72**	3	7	**24**	1
64	**84**	4	35	**71**	3	6	**20**	1
63	**83**	4	34	**71**	3	5	**17**	1
62	**83**	4	33	**70**	3	4	**14**	1
61	**82**	4	32	**69**	3	3	**11**	1
60	**82**	4	31	**68**	3	2	**7**	1
59	**82**	4	30	**67**	3	1	**4**	1
58	**81**	4	29	**66**	3	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.