The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

# ALGEBRA II

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

## MODEL RESPONSE SET

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## Question 25

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

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

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

## Question 25

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

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

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

## Question 25

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

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

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

## Question 25

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

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

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

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

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

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

## Question 26

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

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

$P(D) = .5$

$$\frac{.4}{.5} = \boxed{.8}$$

$P(W|D)$

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

## Question 26

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

50% - drug

50% - sugar pill

recieving drug + getting well = 40%

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

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

## Question 26

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

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

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

$\boxed{.8}$

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

## Question 26

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

$$P(W) \cdot P(D)$$

$$(.4)(.5)$$

$$\boxed{.20}$$

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

## Question 27

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

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

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

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

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

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

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

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

## Question 27

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

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

| | $x^2$ | $y^2$ |
|---|---|---|
| $x^2$ | $x^4$ | $x^2y^2$ |
| $y^2$ | $x^2y^2$ | $y^4$ |

$X^4 + 2X^2Y^2 + Y^4 = X^4 - 2X^3Y^2 + Y^4 + 4X^2Y^2$

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

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

## Question 27

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

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

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

$-x^4 \quad +2x^2y^2 \quad -y^4 \quad -x^4 \quad +2x^2y^2 \quad -y^4$

$4x^2y^2 = 4x^2y^2$ ✓

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

## Question 27

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

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

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

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

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

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

## Question 27

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

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

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

$(2^2+4^2)^2 = (2^2-4^2)^2 + (2(2)(4))^2$
$(4+16)^2 = (4-16)^2 + (16)^2$
$400 = 144 + 256$
$400 \stackrel{\checkmark}{=} 400$

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

**28** Mrs. Jones had hundreds of jelly beans in a bag that contained equal numbers of six different flavors. Her student randomly selected four jelly beans and they were all black licorice. Her student complained and said “What are the odds I got all of that kind?” Mrs. Jones replied, “simulate rolling a die 250 times and tell me if four black licorice jelly beans is unusual.”

Explain how this simulation could be used to solve the problem.

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

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

## Question 28

**28** Mrs. Jones had hundreds of jelly beans in a bag that contained equal numbers of six different flavors. Her student randomly selected four jelly beans and they were all black licorice. Her student complained and said "What are the odds I got all of that kind?" Mrs. Jones replied, "simulate rolling a die 250 times and tell me if four black licorice jelly beans is unusual."

Explain how this simulation could be used to solve the problem.

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

**Score 1:** The student gave an incomplete explanation.

## Question 28

**28** Mrs. Jones had hundreds of jelly beans in a bag that contained equal numbers of six different flavors. Her student randomly selected four jelly beans and they were all black licorice. Her student complained and said "What are the odds I got all of that kind?" Mrs. Jones replied, "simulate rolling a die 250 times and tell me if four black licorice jelly beans is unusual."

Explain how this simulation could be used to solve the problem.

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

**Score 1:** The student gave an incomplete explanation.

**28** Mrs. Jones had hundreds of jelly beans in a bag that contained equal numbers of six different flavors. Her student randomly selected four jelly beans and they were all black licorice. Her student complained and said "What are the odds I got all of that kind?" Mrs. Jones replied, "simulate rolling a die 250 times and tell me if four black licorice jelly beans is unusual."

Explain how this simulation could be used to solve the problem.

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

**Score 0:** The student did not explain the simulation.

## Question 29

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

5 10 20 40

Write a recursive formula for Candy's sequence.

$9 = 2 \cdot 4 + 1$

$19 = 2 \cdot 9 + 1$

$39 = 2 \cdot 18 + 1$

$a_1 = 4$

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

Determine the eighth term in Candy's sequence.

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

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

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

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

## Question 29

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

Write a recursive formula for Candy's sequence.

$2X+1$

Determine the eighth term in Candy's sequence.

6 $2(79)+1=159$

7 $2(159)+1=319$

8 $2(319)+1=639$

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

## Question 29

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

Write a recursive formula for Candy's sequence.

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

Determine the eighth term in Candy's sequence.

$$\underbrace{4,\ 9}_{+5},\ \underbrace{19}_{+10},\ \underbrace{39}_{+20},\ \underbrace{79}_{+40},\ \underbrace{159}_{+80},\ \underbrace{319}_{+160},\ \underbrace{639}_{+320}$$

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

$$\boxed{a_8 = 639}$$

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

## Question 29

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

Write a recursive formula for Candy's sequence.

$a_1 = 4$

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

Determine the eighth term in Candy's sequence.

639

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

## Question 29

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

Write a recursive formula for Candy's sequence.

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

$n(2.25)^x$

Determine the eighth term in Candy's sequence.

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

$a_8 = 1167.717041$

**Score 0:** The student provided no correct work.

## Question 29

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

Write a recursive formula for Candy's sequence.

$n = 2n + 1$

Determine the eighth term in Candy's sequence.

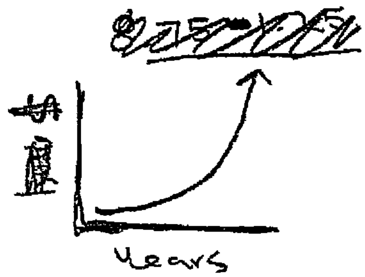
4, 9, 19, 39, 79, 159, 317, 633

$\boxed{633}$

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

## Question 30

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




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

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

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

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

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

## Question 30

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

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

$7 = x^{49}$

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

$\boxed{x = 1.04}$

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

## Question 30

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

$$A = e^{rt}$$

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

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

$$r = .0411\ldots$$

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

**Score 1:** The student made an error by subtracting 8.75 − 1.25.

## Question 30

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

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

$$-8.75 = 3.397\ldots^{k(49)}$$

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

$$1.7733 = 49k$$

$$.036 = k$$

$$\boxed{4\%}$$

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

## Question 31

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

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

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

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

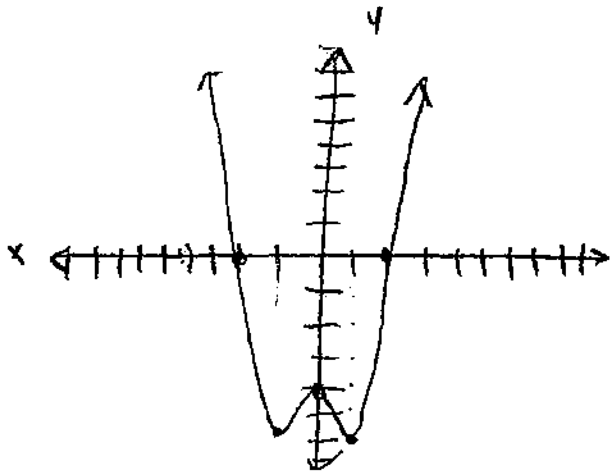
$\boxed{j(-x) = j(x)}$

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

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

## Question 31

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




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

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

## Question 31

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

$j(-1) = -6$

$j(1) = -6$

$j(x)$ is even

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

## Question 31

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

even because all exponents are even.

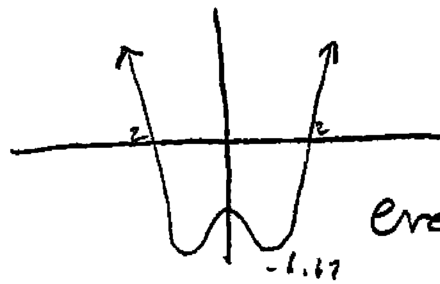
**Score 1:** The student used a method other than algebraic.

## Question 31

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

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

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




even

even has two arrows going same way up

it's not add

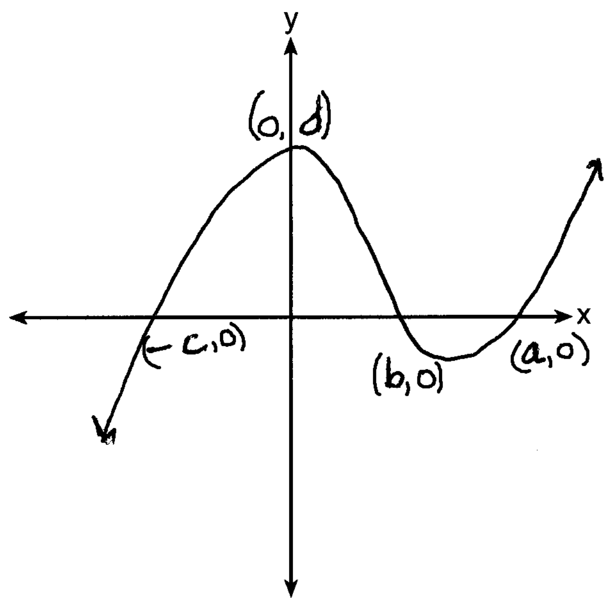
~~because~~

it will have

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

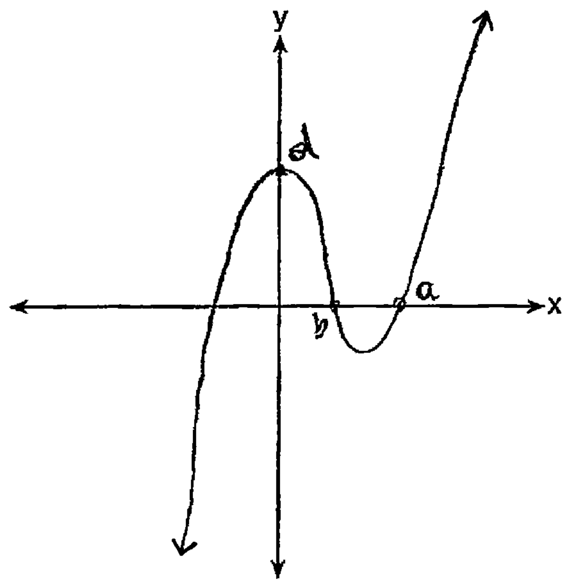
## Question 32

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




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

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



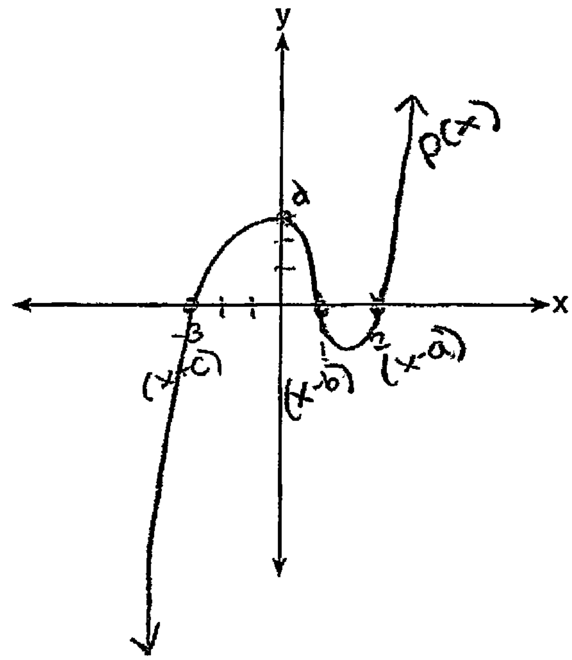

**Score 1:** The student did not label the intercept at $-c$.

## Question 32

$x=2$ $x=1$

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

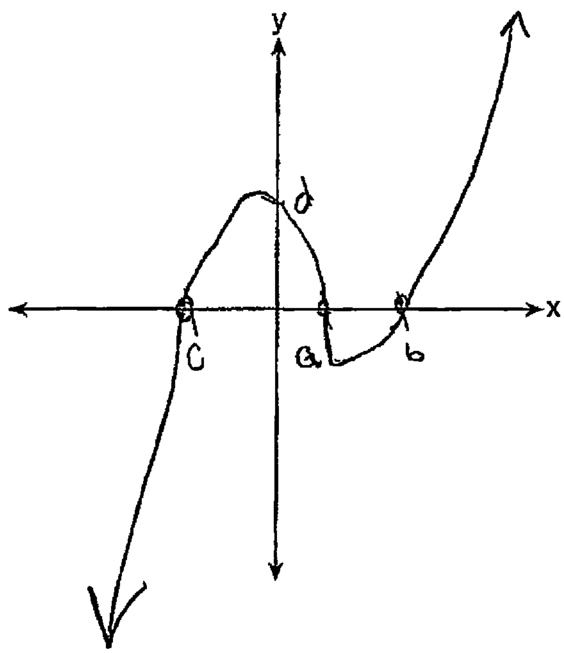
**32** On the axes below, sketch a possible function $p(x) = (x - a)(x - b)(x + c)$, where $a$, $b$, and $c$ are positive, $a > b$, and $p(x)$ has a positive $y$-intercept of $d$. Label all intercepts.




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

## Question 32

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




**Score 0:** The student made multiple labeling errors.

## Question 33

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

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

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

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

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

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

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

Check

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

Check

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

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

## Question 33

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

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

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

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

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

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

$$p+1=0 \text{ or } p+5=0$$

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

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

## Question 33

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

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

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

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

$-p^2+5p \qquad -p^2+5p$

$2p^2+16p-10=0$

$\frac{2(p^2+8p-5)}{2}=\frac{0}{2}$

$p^2+8p-5=0$

$a=1 \quad b=8 \quad c=-5$

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

$x=\frac{-8\pm\sqrt{8^2-4(1)(-5)}}{2(1)}$

$=\frac{-8\pm\sqrt{64+20}}{2}$

$=\frac{-8\pm\sqrt{84}}{2}$

$=\frac{-8\pm2\sqrt{21}}{2}$

$=\frac{2(-4\pm\sqrt{21})}{2}$

$=-4\pm\sqrt{21}$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$3p^2 + 9p = p^2 - 3p - 10$$
$$-p^2 \qquad -p^2$$
$$2p^2 + 9p = -3p - 10$$
$$+3p \; +3p$$
$$2p^2 + 12p = -10$$
$$+10 \qquad +10$$
$$2p^2 + 12p + 10$$

**Score 1:** The student wrote a correct quadratic expression.

## Question 33

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

$p-5 \quad p$

$p-5 \quad 3$

$p^2-2p-15$

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

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

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

$$p = 1$$

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

**34** Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book.

per day, + .25

Suppose the total amount Simon owes when the book is $n$ days late can be determined by an arithmetic sequence. Determine a formula for $a_n$, the $n$th term of this sequence.

5 days 2.25

16 \<   4.00 dif.   card: \$1.

21 days 6.25

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

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

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

$\boxed{\$16.00}$   60 · .25

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

1.25 + 14.75

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

## Question 34

**34** Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book.

Suppose the total amount Simon owes when the book is $n$ days late can be determined by an arithmetic sequence. Determine a formula for $a_n$, the $n$th term of this sequence.

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

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

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

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

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

$a_{60} = 16$

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

**34** Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book.

5 days → \$2.25
1 card

21 days → 6.25
1 card

Suppose the total amount Simon owes when the book is $n$ days late can be determined by an arithmetic sequence. Determine a formula for $a_n$, the $n$th term of this sequence.

$a_5 = 2.25$

$a_{21} = 6.25$

$6.25 = a_1 + d(20)$

$1.25 = a_1 + d(4)$

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

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

$a_1 = 1.25$

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

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

$a_n = .25n + 1$

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

$\boxed{\$16}$

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

**34** Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book.

Suppose the total amount Simon owes when the book is $n$ days late can be determined by an arithmetic sequence. Determine a formula for $a_n$, the $n$th term of this sequence.

a = amount due per day late
n = number of days late
$.25n + 1.00$ → Money needed to replace card

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

$.25 \cdot 60 = 15$
$15 + 1 = 16$

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

**Score 3**: The student wrote an expression for $a_n$.

## Question 34

**34** Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book.

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

Suppose the total amount Simon owes when the book is $n$ days late can be determined by an arithmetic sequence. Determine a formula for $a_n$, the $n$th term of this sequence.

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

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

$$a_n = 2.25 + (n-1).25$$

$$a_{60} = 2.25 + (59).25$$

$$\boxed{a_{60} = \$17}$$

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

**34** Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book.

Suppose the total amount Simon owes when the book is $n$ days late can be determined by an arithmetic sequence. Determine a formula for $a_n$, the $n$th term of this sequence.

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

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

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

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

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

$2.25 + (59)4$

$\boxed{= \$238.25}$

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

**34** Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book.

Suppose the total amount Simon owes when the book is $n$ days late can be determined by an arithmetic sequence. Determine a formula for $a_n$, the $n$th term of this sequence.

5 21

2.25 6.25

4 days = 1 dollar

25¢ = 1 day

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

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

\$16.00

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

## Question 34

**34** Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book.

Suppose the total amount Simon owes when the book is $n$ days late can be determined by an arithmetic sequence. Determine a formula for $a_n$, the $n$th term of this sequence.

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

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

$\boxed{\$16.00}$

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

**34** Simon lost his library card and has an overdue library book. When the book was 5 days late, he owed \$2.25 to replace his library card and pay the fine for the overdue book. When the book was 21 days late, he owed \$6.25 to replace his library card and pay the fine for the overdue book.

Suppose the total amount Simon owes when the book is $n$ days late can be determined by an arithmetic sequence. Determine a formula for $a_n$, the $n$th term of this sequence.

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

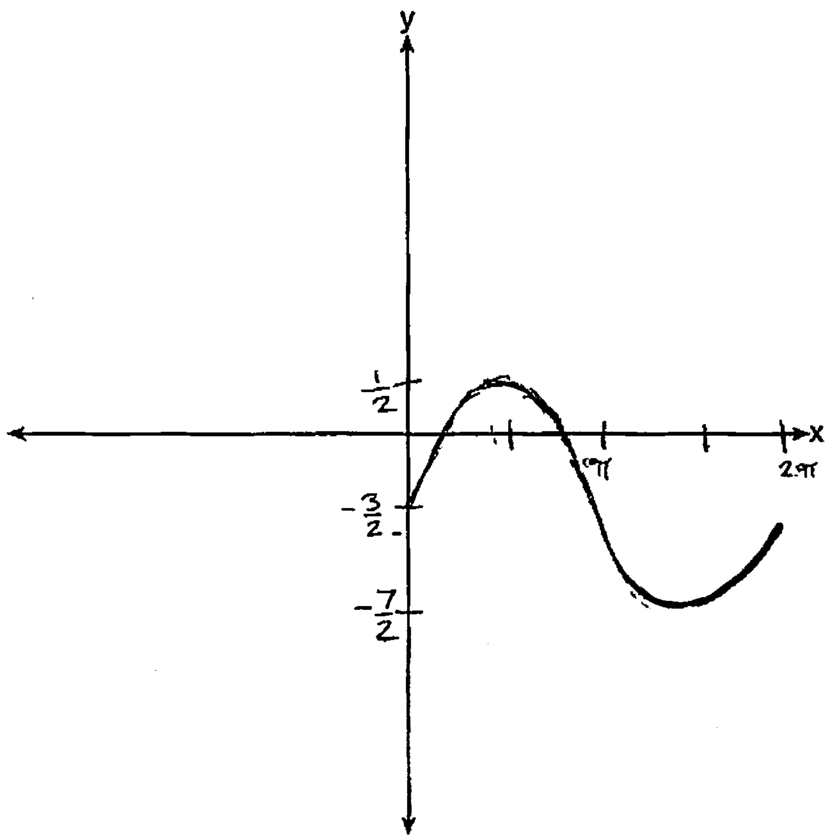
Use the formula to determine the amount of money, in dollars, Simon needs to pay when the book is 60 days late.

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

\$15.93

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

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

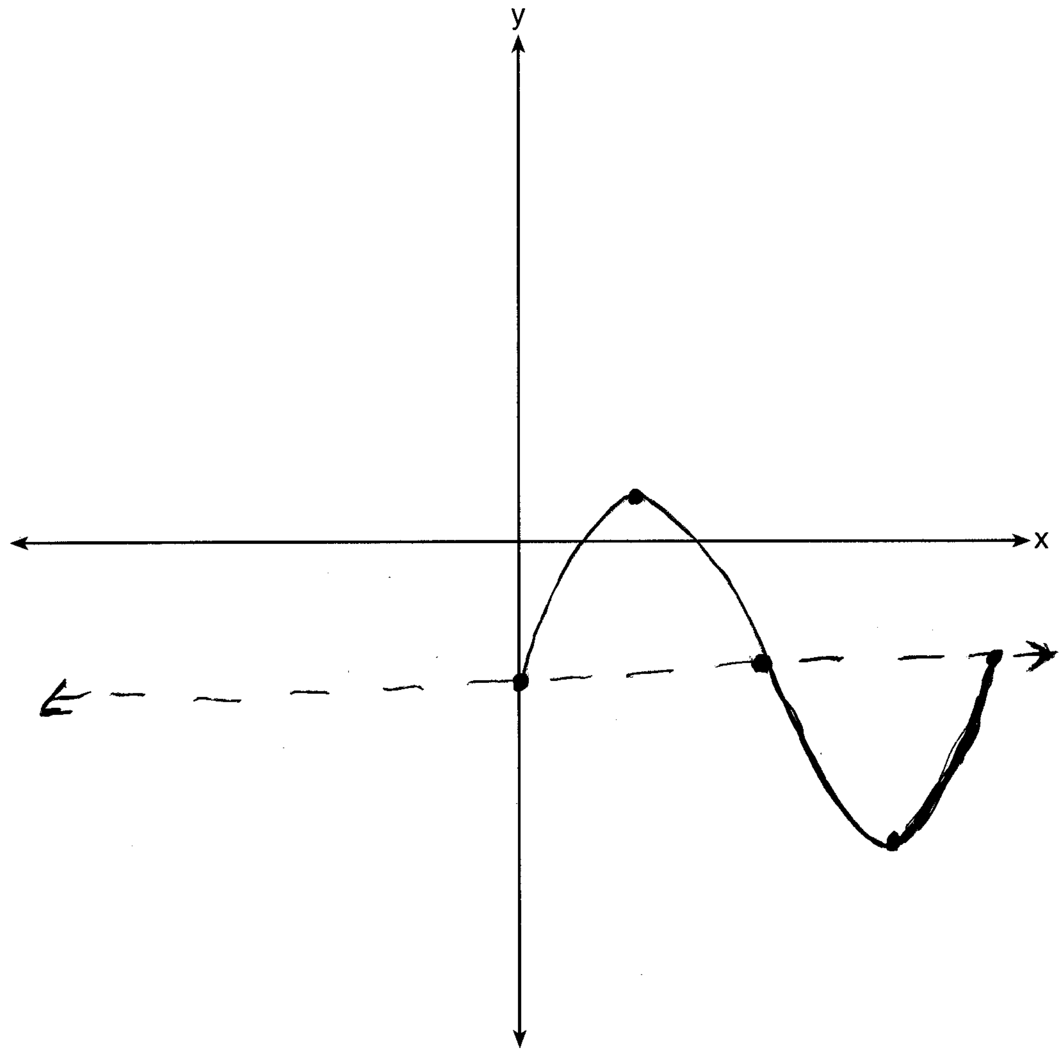



b) Explain any differences between a sketch of $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part *a*.

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

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

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



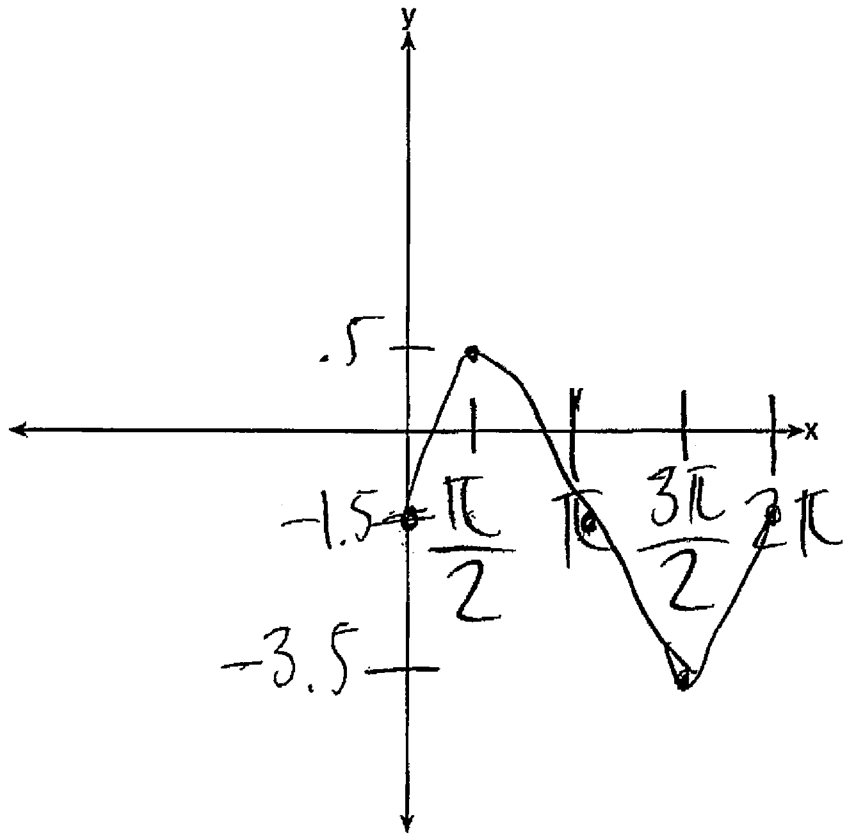

b) Explain any differences between a sketch of $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part *a*.

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

**Score 3:** The student did not label the sketch.

## Question 35

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



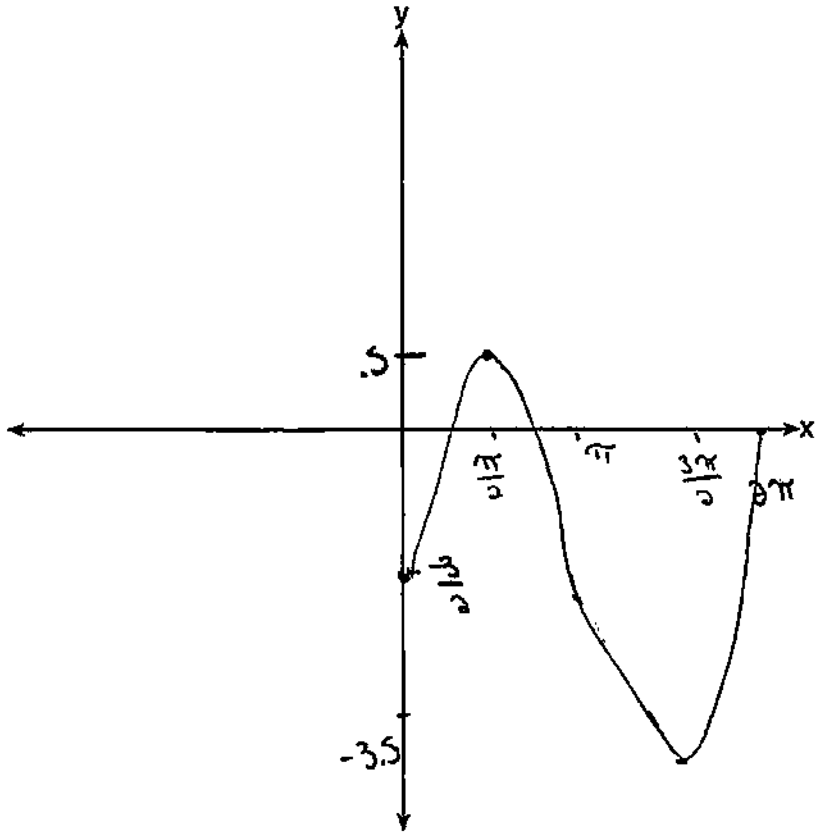

b) Explain any differences between a sketch of $y = 2 \sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part *a*.

the values would be doubled

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

## Question 35

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

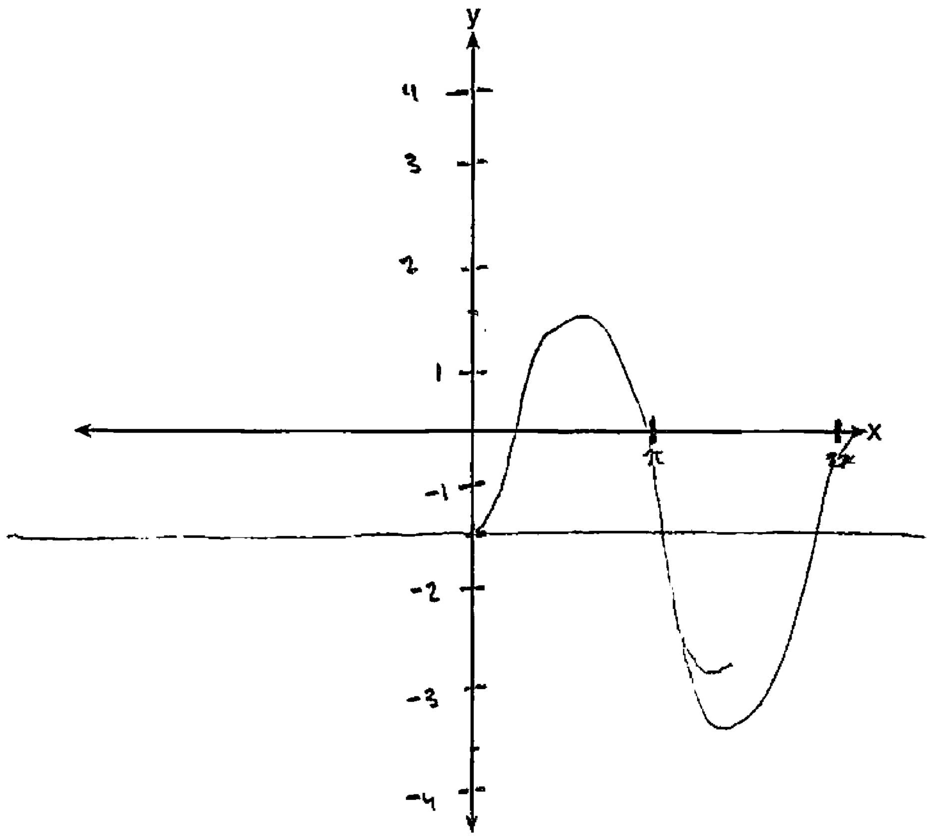



b) Explain any differences between a sketch of $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part *a*.

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

## Question 35

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

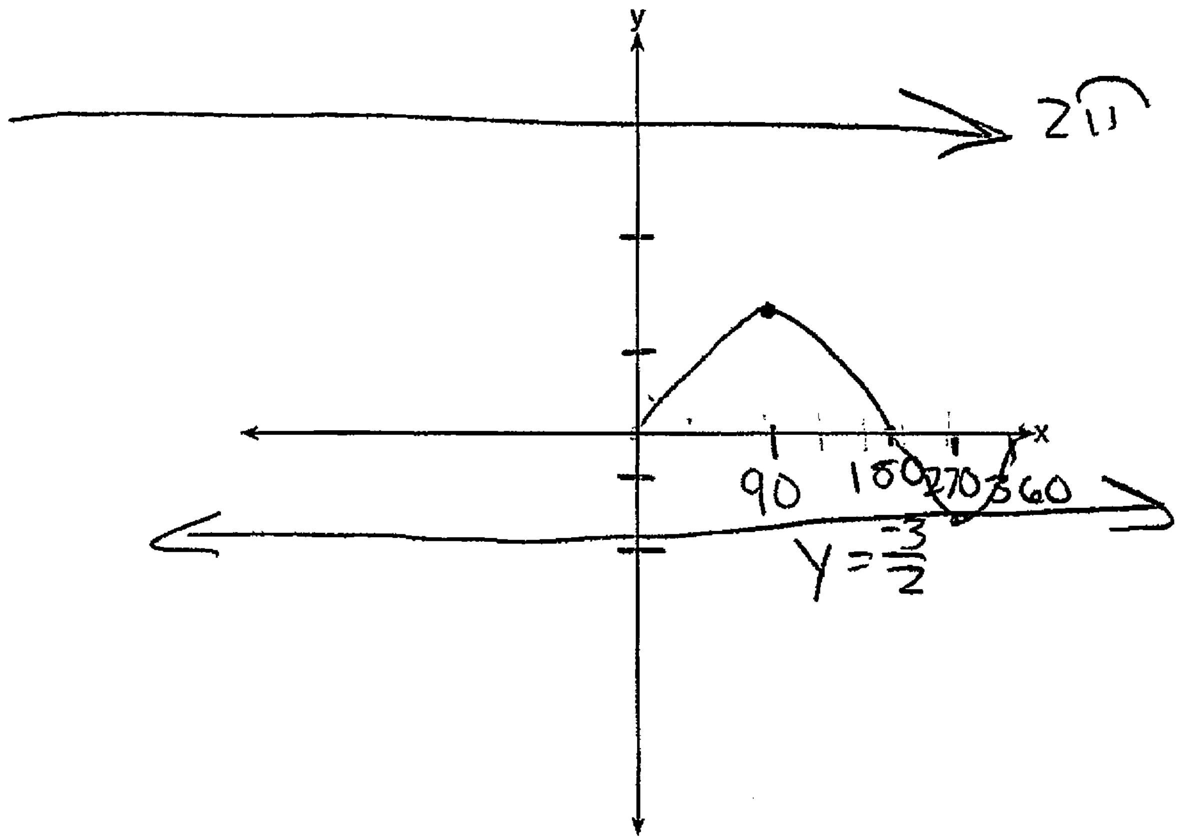



b) Explain any differences between a sketch of $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part *a*.

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

## Question 35

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



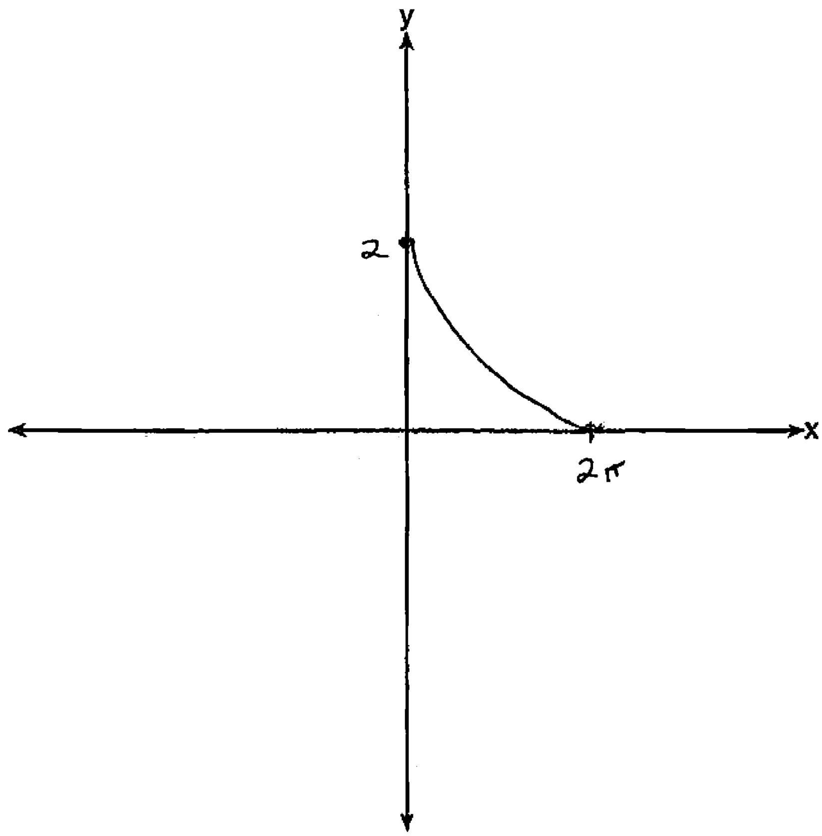

b) Explain any differences between a sketch of $y = 2\sin\left(x - \frac{\pi}{3}\right) - \frac{3}{2}$ and the sketch from part *a*.

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

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

## Question 35

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




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

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

**Score 0:** The student gave a completely incorrect response.

## Question 36

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

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

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

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

$y = 4.168(3.981)^x$

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

$y = 4.168(3.981)^x$

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

$23.992 = (3.981)^x$

$\log 23.992 = \log 3.981^x$

$\log 23.992 = x \log 3.981$

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

$2.300 = x$

$x = 2.25$ hours or
2 hours + 15 minutes

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

## Question 36

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

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

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

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

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

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

| x | y |
|---|---|
| 2.25 | 93.306 |
| 2.5 | 131.8 |

2.25 hours

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

## Question 36

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

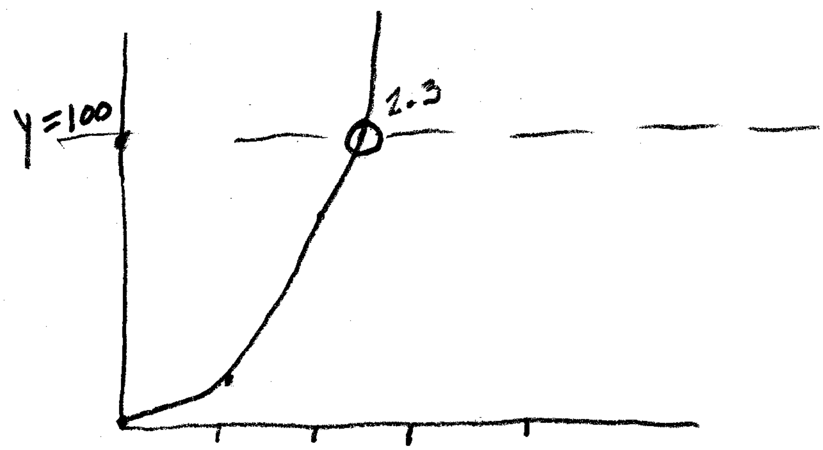
| **Hours** (x) | **Average Number of Spores** (y) |
|---|---|
| 0 | 4 |
| 0.5 | 10 |
| 1 | 15 |
| 2 | 60 |
| 3 | 260 |
| 4 | 1130 |
| 6 | 16,380 |

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

$y = ab^x$

$a = 4.168$

$b = 3.981$




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

$2.3 \approx 2.25$ hrs

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

## Question 36

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

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

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

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

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

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

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

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

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

$$x \leq 2.3$$

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

## Question 36

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

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

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

STAT 1 Edit...

STAT CALC 0 ExpReg

$y = ab^x$

$y = 4.16798(3.98061)^x$

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

$y = 4.16798(3.98061)^x$

$100 = 4.16798(3.98061)^x$

$23.99243 = 3.98061^x$

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

## Question 36

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

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

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

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

$b = 3.898204241$

$y = 4.674 \cdot 3.898^x$

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

$x = 2.25$ hrs

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

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

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

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

$y=abx$  $a=4.167983971$  $b=3.98069454$

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

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

$100=4.168(3.98x)$

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

$6.02670715=x$

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

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

## Question 36

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

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

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

$2252.567x - 2758.336$

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

$2252.567(100) - 2758.336$

$2252.567(-2658.336)$

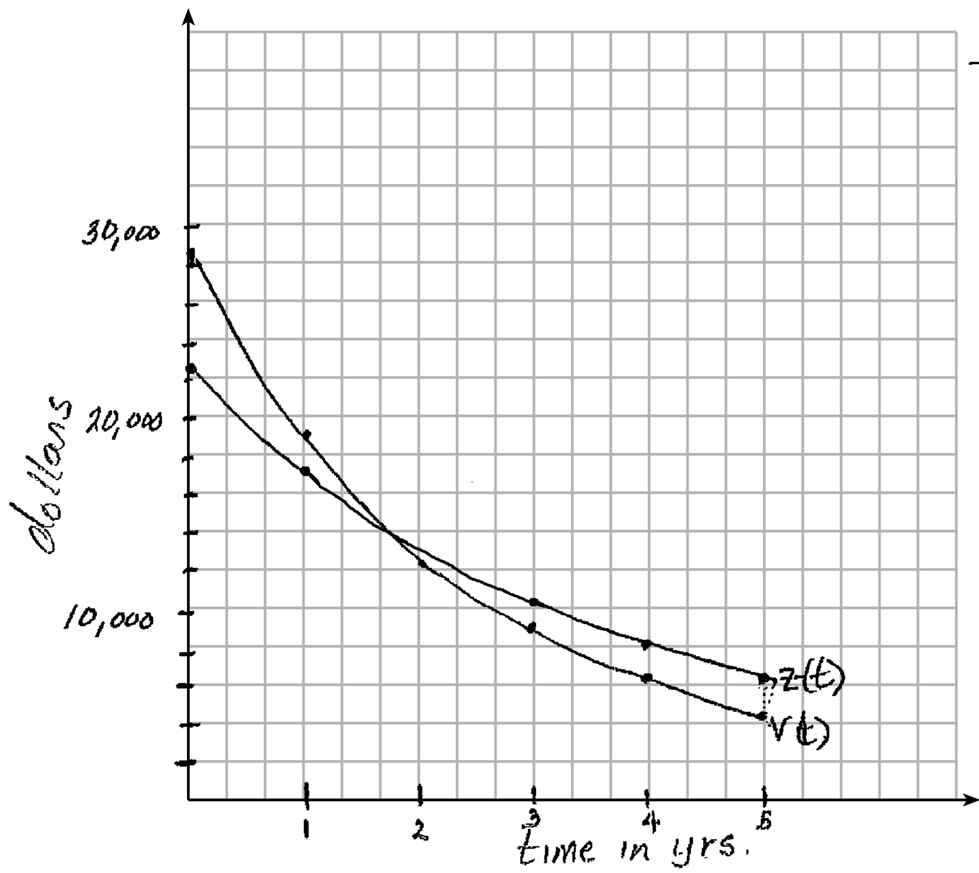
$-5988079.949$

**Score 0:** The student showed no correct work.

## Question 37

**37** The value of a certain small passenger car based on its use in years is modeled by $V(t) = 28482.698(0.684)^t$, where $V(t)$ is the value in dollars and $t$ is the time in years. Zach had to take out a loan to purchase the small passenger car. The function $Z(t) = 22151.327(0.778)^t$, where $Z(t)$ is measured in dollars, and $t$ is the time in years, models the unpaid amount of Zach's loan over time.

Graph $V(t)$ and $Z(t)$ over the interval $0 \le t \le 5$, on the set of axes below.




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

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

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

## Question 37

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

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

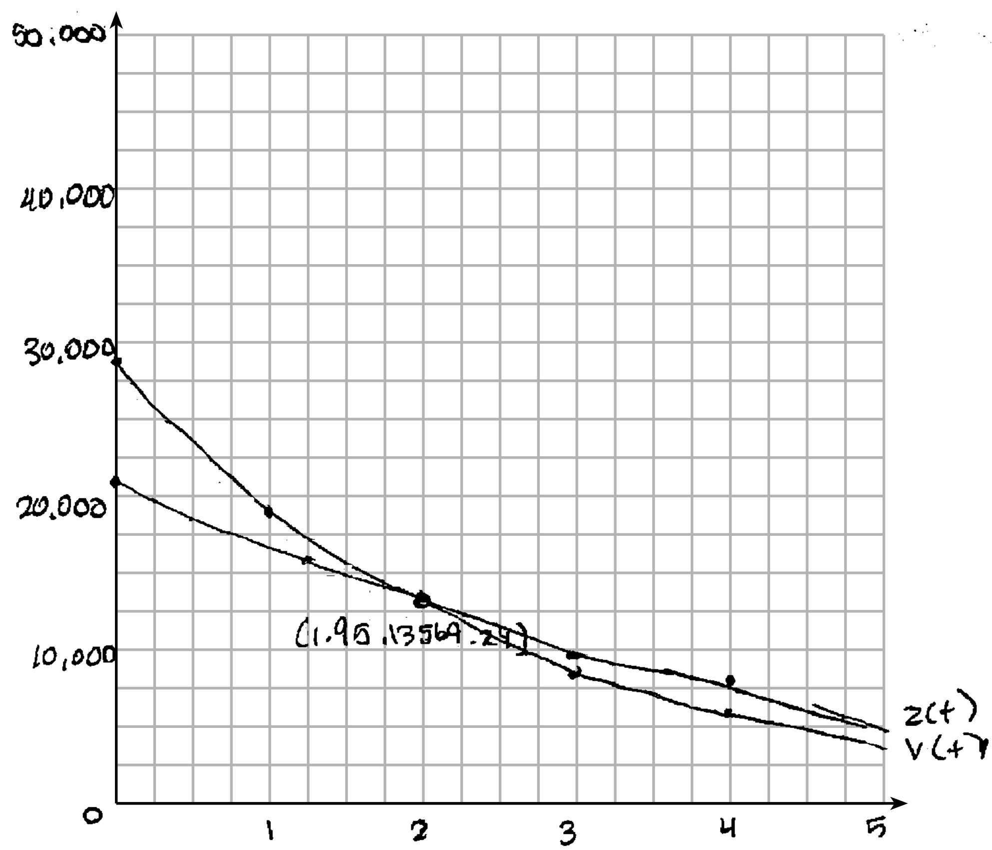
at $t = 1.95$ yrs, the value of the car is exactly equal to the unpaid amount of Zachs loan.

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

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

**37** The value of a certain small passenger car based on its use in years is modeled by $V(t) = 28482.698(0.684)^t$, where $V(t)$ is the value in dollars and $t$ is the time in years. Zach had to take out a loan to purchase the small passenger car. The function $Z(t) = 22151.327(0.778)^t$, where $Z(t)$ is measured in dollars, and $t$ is the time in years, models the unpaid amount of Zach's loan over time.

Graph $V(t)$ and $Z(t)$ over the interval $0 \le t \le 5$, on the set of axes below.




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

## Question 37

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

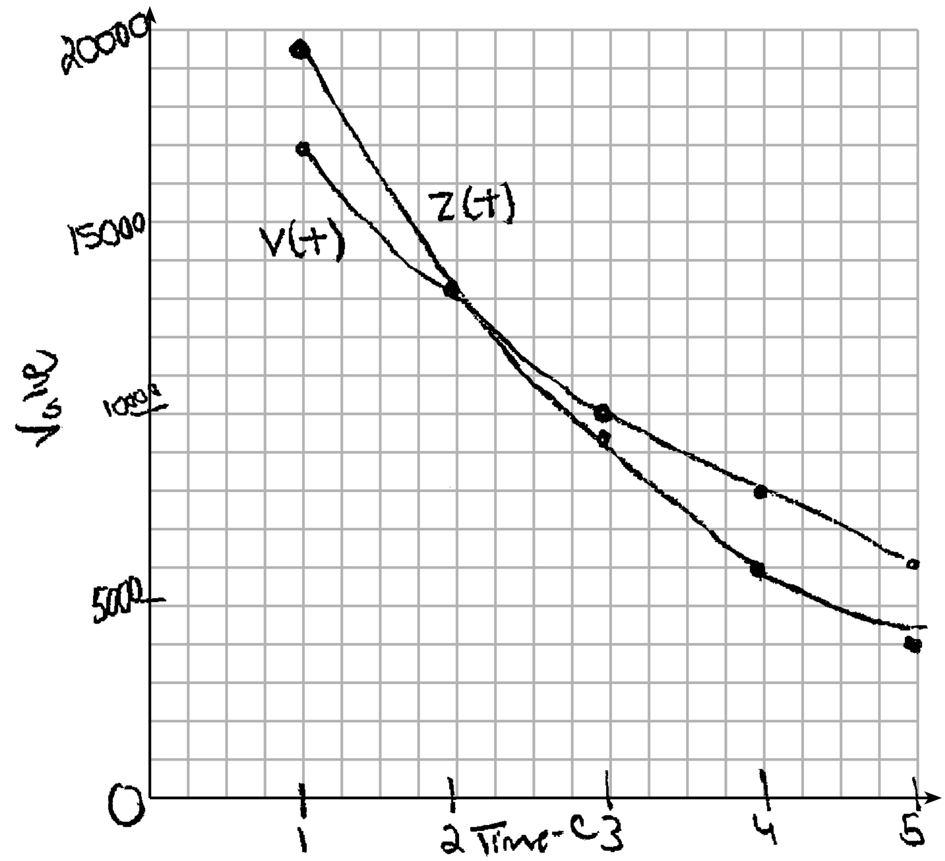
They intersect at (1.95, 13569.24). This means that the value of the car at that time was the same as the unpaid amount of Zach's at that time.

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

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

**37** The value of a certain small passenger car based on its use in years is modeled by $V(t) = 28482.698(0.684)^t$, where $V(t)$ is the value in dollars and $t$ is the time in years. Zach had to take out a loan to purchase the small passenger car. The function $Z(t) = 22151.327(0.778)^t$, where $Z(t)$ is measured in dollars, and $t$ is the time in years, models the unpaid amount of Zach's loan over time.

Graph $V(t)$ and $Z(t)$ over the interval $0 \le t \le 5$, on the set of axes below.




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

## Question 37

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

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

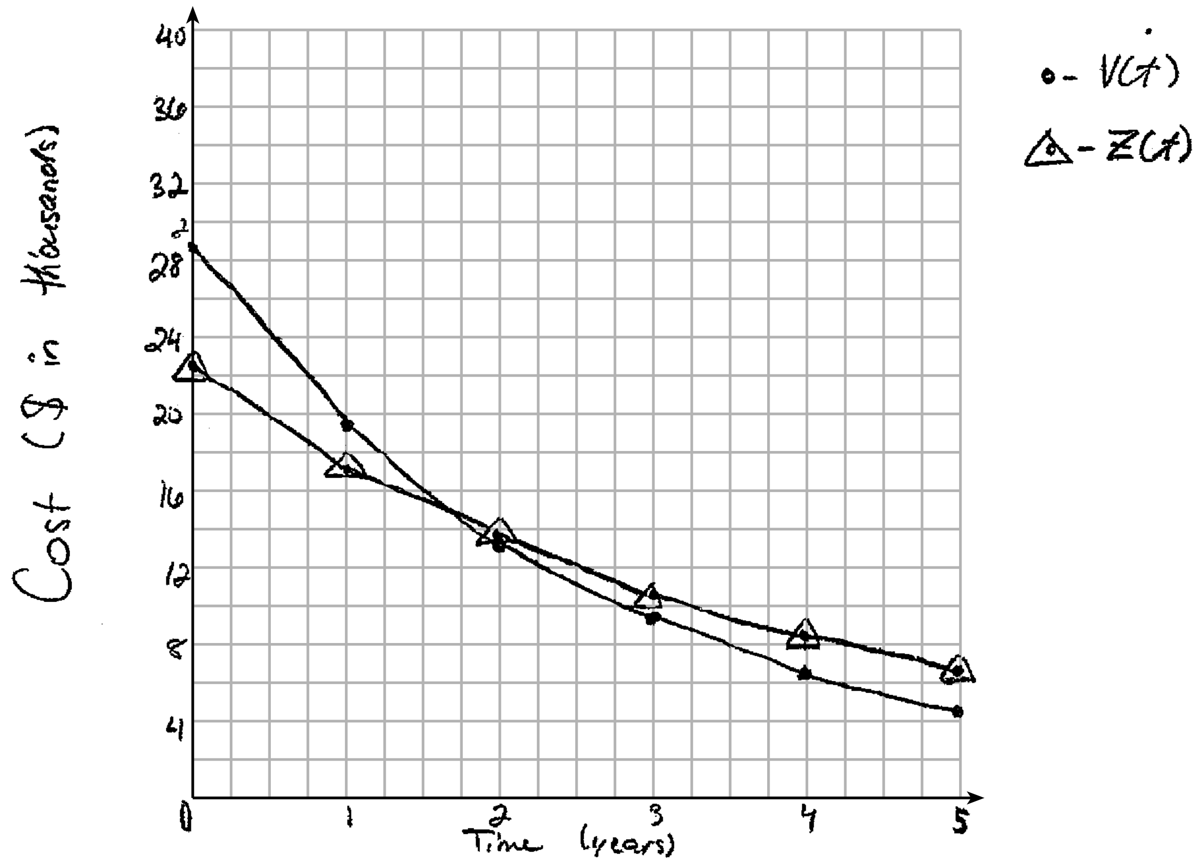
Zach takes out an insurance policy that requires him to pay a $3000 deductible in case of a collision. Zach will cancel the collision policy when the value of his car equals his deductible. To the *nearest year*, how long will it take Zach to cancel this policy? Justify your answer.

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

# Question 37

**37** The value of a certain small passenger car based on its use in years is modeled by $V(t) = 28482.698(0.684)^t$, where $V(t)$ is the value in dollars and $t$ is the time in years. Zach had to take out a loan to purchase the small passenger car. The function $Z(t) = 22151.327(0.778)^t$, where $Z(t)$ is measured in dollars, and $t$ is the time in years, models the unpaid amount of Zach's loan over time.

Graph $V(t)$ and $Z(t)$ over the interval $0 \leq t \leq 5$, on the set of axes below.




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

## Question 37

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

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

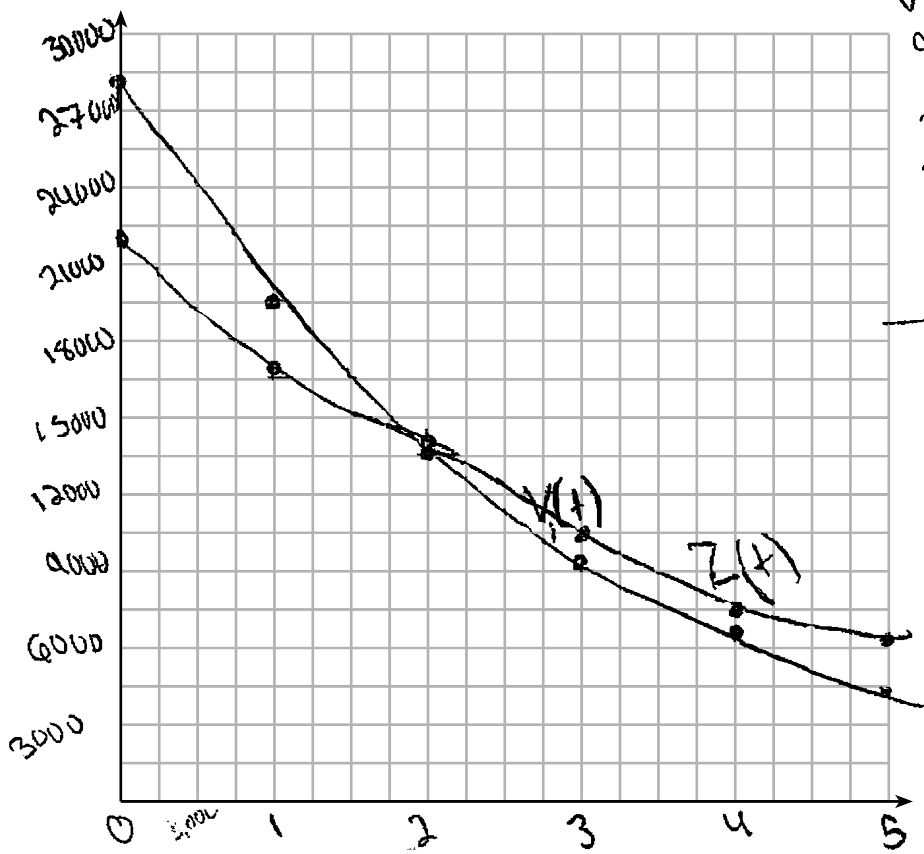
Zach takes out an insurance policy that requires him to pay a \$3000 deductible in case of a collision. Zach will cancel the collision policy when the value of his car equals his deductible. To the *nearest year,* how long will it take Zach to cancel this policy? Justify your answer.

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

## Question 37

**37** The value of a certain small passenger car based on its use in years is modeled by $V(t) = 28482.698(0.684)^t$, where $V(t)$ is the value in dollars and $t$ is the time in years. Zach had to take out a loan to purchase the small passenger car. The function $Z(t) = 22151.327(0.778)^t$, where $Z(t)$ is measured in dollars, and $t$ is the time in years, models the unpaid amount of Zach's loan over time.

Graph $V(t)$ and $Z(t)$ over the interval $0 \leq t \leq 5$, on the set of axes below.




V(t)
0 = 28482.698
1 = 19482.16543
2 = 13325.80116
3 = 9114.84744
6234.5
4264

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

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

## Question 37

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

between 2 & 2.5 years

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

2

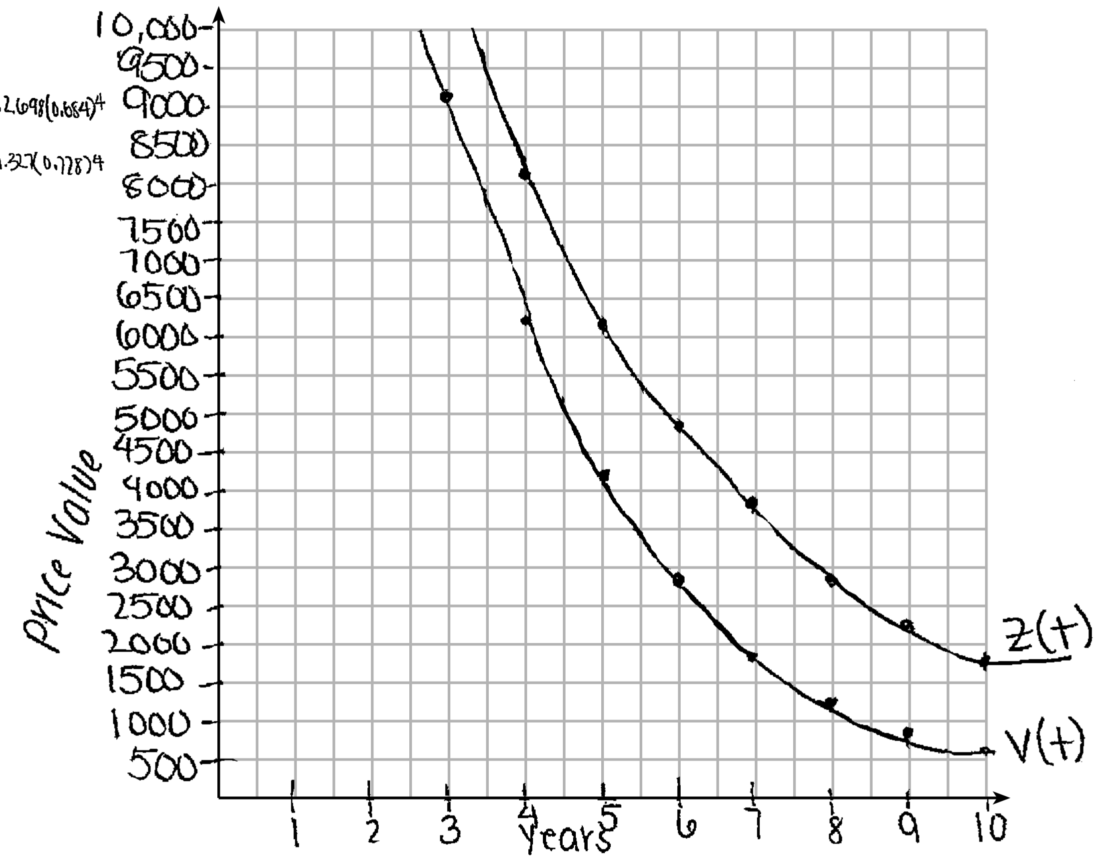
## Question 37

**37** The value of a certain small passenger car based on its use in years is modeled by $V(t) = 28482.698(0.684)^t$, where $V(t)$ is the value in dollars and $t$ is the time in years. Zach had to take out a loan to purchase the small passenger car. The function $Z(t) = 22151.327(0.778)^t$, where $Z(t)$ is measured in dollars, and $t$ is the time in years, models the unpaid amount of Zach's loan over time.

Graph $V(t)$ and $Z(t)$ over the interval $0 \leq t \leq 5$, on the set of axes below.

$V(t)=28482.698(0.684)^t$

$Z(t)=22151.327(0.778)^t$




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

## Question 37

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

(1.9523346, 13564.237)

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

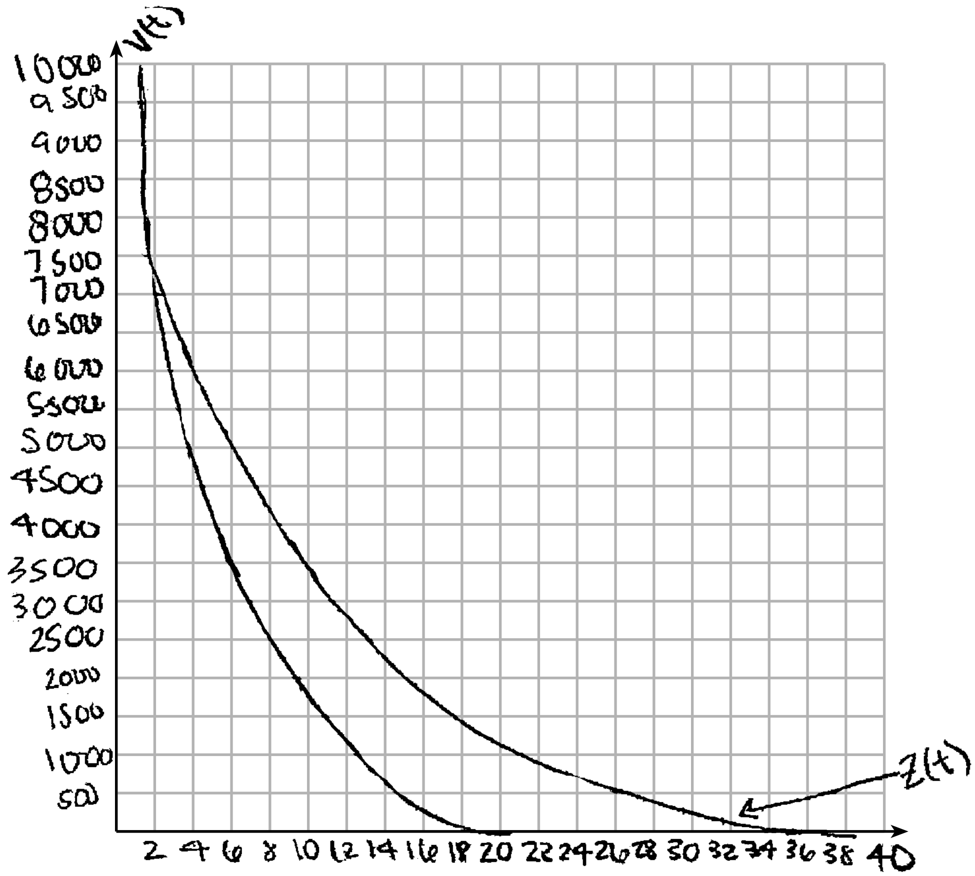
Zach takes out an insurance policy that requires him to pay a $3000 deductible in case of a collision. Zach will cancel the collision policy when the value of his car equals his deductible. To the *nearest year*, how long will it take Zach to cancel this policy? Justify your answer.

8 years

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

**37** The value of a certain small passenger car based on its use in years is modeled by $V(t) = 28482.698(0.684)^t$, where $V(t)$ is the value in dollars and $t$ is the time in years. Zach had to take out a loan to purchase the small passenger car. The function $Z(t) = 22151.327(0.778)^t$, where $Z(t)$ is measured in dollars, and $t$ is the time in years, models the unpaid amount of Zach's loan over time.

Graph $V(t)$ and $Z(t)$ over the interval $0 \leq t \leq 5$, on the set of axes below.




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

**Question 37**

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

(1.95, 13569.24)

Where the two costs of the cars meet

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

After 30 because he would almost be done paying