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

ALGEBRA II

Friday, June 21, 2019 — 1:15 to 4:15 p.m., only

MODEL RESPONSE SET

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Question 25

25 The table below shows the number of hours of daylight on the first day of each month in Rochester, NY.

Month	Hours of Daylight
Jan.	9.4
Feb.	10.6
March	11.9
April	13.9
May	14.7
June	15.4
July	15.1
Aug.	13.9
Sept.	12.5
Oct.	11.1
Nov.	9.7
Dec.	9.0

2
1.3
2

Given the data, what is the average rate of change in hours of daylight per month from January 1st to April 1st?

1.5

Interpret what this means in the context of the problem.

It means that over the course from January to April, the average rate of change of the number of hours of daylight is 1.5.

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

Question 25

25 The table below shows the number of hours of daylight on the first day of each month in Rochester, NY.

	Month	Hours of Daylight
1	Jan.	9.4
2	Feb.	10.6
3	March	11.9
4	April	13.9
	May	14.7
	June	15.4
	July	15.1
	Aug.	13.9
	Sept.	12.5
	Oct.	11.1
	Nov.	9.7
	Dec.	9.0

Given the data, what is the average rate of change in hours of daylight per month from January 1st to April 1st?

$$\frac{\Delta y}{\Delta x} = \frac{13.9 - 9.4}{4 - 1} = 1.5$$

Interpret what this means in the context of the problem.

On average, the number of hours of daylight increased 1.5 hours per month from January – April.

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

25 The table below shows the number of hours of daylight on the first day of each month in Rochester, NY.

Month	Hours of Daylight
Jan.	9.4
Feb.	10.6
March	11.9
April	13.9
May	14.7
June	15.4
July	15.1
Aug.	13.9
Sept.	12.5
Oct.	11.1
Nov.	9.7
Dec.	9.0

Given the data, what is the average rate of change in hours of daylight per month from January 1st to April 1st?

$$\frac{13.9-9.4}{4-1}=\frac{4.5}{3}=\boxed{1.5}$$

Interpret what this means in the context of the problem.

On average, the temperature increased by 1.5 degrees every month.

Score 1: The student gave an incorrect interpretation.

Question 25

25 The table below shows the number of hours of daylight on the first day of each month in Rochester, NY.

Month	Hours of Daylight
Jan.	9.4
Feb.	10.6
March	11.9
April	13.9
May	14.7
June	15.4
July	15.1
Aug.	13.9
Sept.	12.5
Oct.	11.1
Nov.	9.7
Dec.	9.0

Given the data, what is the average rate of change in hours of daylight per month from January 1st to April 1st?

$\frac{\Delta y}{\Delta x}$ $\frac{4.5}{3}$ 1.5 hrs/month

Interpret what this means in the context of the problem.

Every month from January to April, there are 1.5 more hours of daylight

Score 1: The student gave an incomplete interpretation.

Question 25

25 The table below shows the number of hours of daylight on the first day of each month in Rochester, NY.

Month	Hours of Daylight
Jan.	9.4
Feb.	10.6
March	11.9
April	13.9
May	14.7
June	15.4
July	15.1
Aug.	13.9
Sept.	12.5
Oct.	11.1
Nov.	9.7
Dec.	9.0

Given the data, what is the average rate of change in hours of daylight per month from January 1st to April 1st?

Jan → Apr.

$9.4 - 13.9 = \boxed{4.5}$

Interpret what this means in the context of the problem.

It means from January to April, ~~th~~ the number of daylight hours increases by 4.5

Score 0: The student found an incorrect average rate of change and wrote an incomplete interpretation.

Question 26

26 Algebraically solve for x:

$$\frac{7}{2x} - \frac{2}{x+1} = \frac{1}{4}$$

$$\frac{7}{2x} - \frac{2}{x+1} = \frac{1}{4}$$

$$\frac{(7)x+1}{(2x)\cdot x+1} - \frac{2 \cdot 2x}{(x+1)\cdot 2x}$$

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

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

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

$$(2x)(x+1) = (4)(3x+7)$$

$$2x^2+2x = 12x+28$$

$$-12x \quad -12x$$

$$2x^2-10x = 28$$

$$-28 \quad -28$$

$$2x^2-10x-28 = 0$$

$$2(x^2-5x-14) = 0$$

$$2(x+2)(x-7) = 0 \rightarrow x=-2,\ x=7$$

-14

$2 \,|\, 1 \quad 14$
$\quad\;\, 7$

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

Question 26

26 Algebraically solve for x:

$(x+1)\cdot 4 \qquad 2\cdot 2x(x+1)\cdot 4 \qquad 2x(x+1)\cdot 4$

$$\frac{7}{2x} - \frac{2}{x+1} = \frac{1}{4}$$

$28(x+1) - 16x = 2x(x+1)$

$28x + 28 - 16x = 2x^2 + 2x$

LCD: $2x(x+1)\cdot 4$

$12x + 28 = 2x^2 + 2x$

$0 = 2x^2 - 12x + 2x - 28$

$0 = 2x^2 - 10x - 28$

$(2x+4)(1x-7) = 0$

$2x+4=0$	$1x-7=0$
$2x=-4$	$+7 \quad +7$
$\frac{2x}{2} = \frac{-4}{2}$	$x = 7$
$x = -2$	

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

Question 26

26 Algebraically solve for x:

$$\frac{7}{2x} - \frac{2}{x+1} = \frac{1}{4}$$

$$\frac{7}{-4} - \frac{2}{-1} = \frac{1}{4}$$

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

$$\frac{7x+7}{2x^2+2x} - \frac{4x}{2x^2+2x} = \frac{1}{4}$$

$$\frac{3x+7}{2x^2+2x} \times \frac{1}{4}$$

-56

$-14 \quad +4$

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

$12x + 28 = 2x^2 + 2x$

$-2x \qquad -2x$

$10x + 28 = 2x^2$

$2x^2 - 10x - 28 = 0$

$2x^2 + 4x - \cancel{28}x - 28 = 0$

$2x(x+2) - 14(x+2) = 0$

$2x - 14 = 0 \qquad x + 2 = 0$

$+14 \quad +14 \qquad -2 \quad -2$

$x = 7 \qquad \frac{2x}{2} = \frac{14}{2} \qquad x = -2$

$x = \{7\}$

-2 is extraneous root

Score 1: The student incorrectly identified -2 as an extraneous root.

Question 26

26 Algebraically solve for x:

$$(x+1)\frac{7}{2x} - \cancel{(2x)}\frac{2}{x+1} = \frac{1}{4}$$

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

$$2x(x+1) = 28x+28-16x$$

$$2x^2+2x = 12x+28$$

$$-12x \; -28$$

$$2x^2-10x-28=0$$

$$2(x^2-5x-14)=0$$

$$2(x+2)(x-7)=0$$

$$2x+2=0 \qquad \boxed{x=7}$$

$$-2$$

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

$\cancel{x=-1}$

undefined

Score 1: The student made a computational error by not distributing the 2 correctly.

Question 26

26 Algebraically solve for x:

$$\frac{7}{2x} - \frac{2}{x+1} = \frac{1}{4}$$

$$\frac{7}{2x} - \frac{2}{x+1} = \frac{1}{4}$$

$$7x + 7 - 4x = \frac{1}{4}$$

$$3x + 7 = \frac{1}{4}$$

$$-7 \quad -7$$

? $$\frac{3x}{3} = \frac{6.75}{3}$$

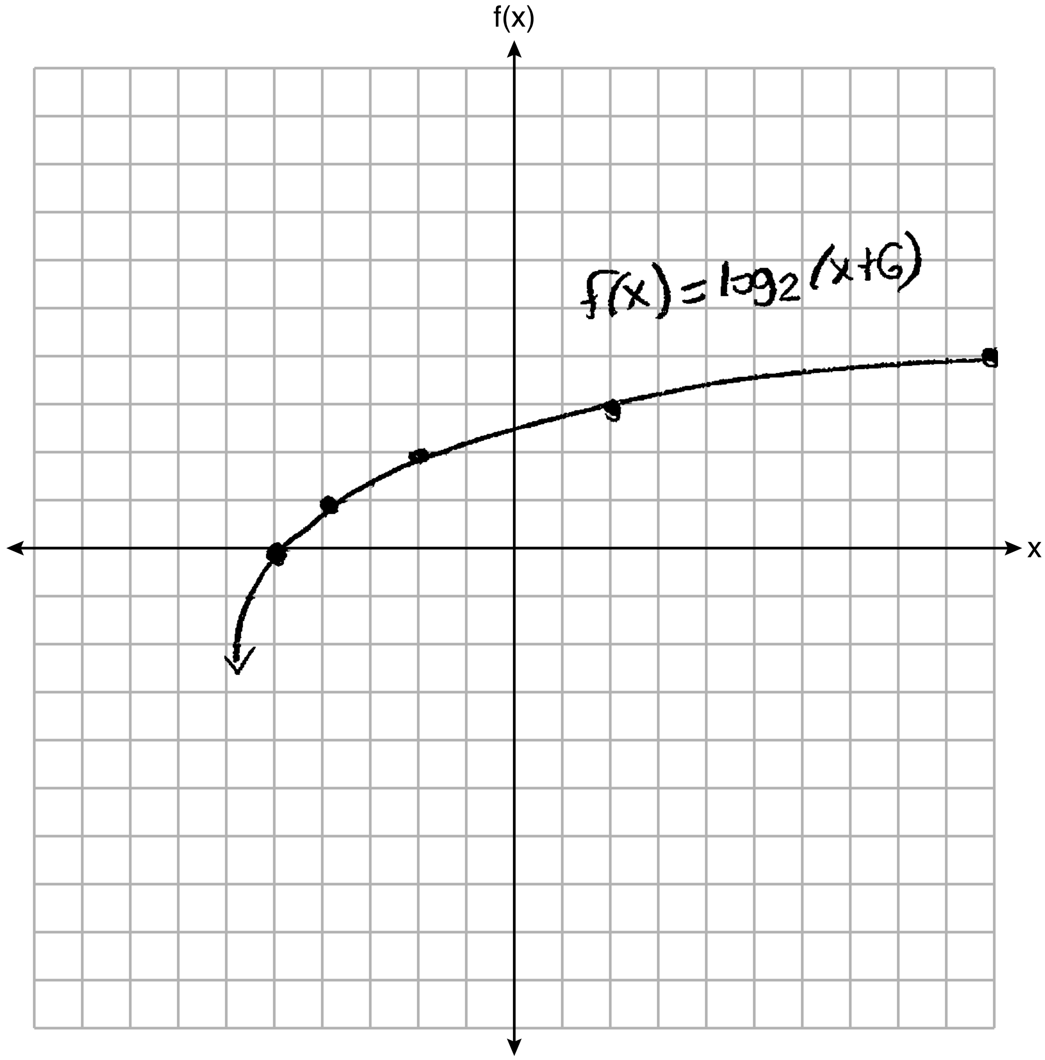
$$x = 2.25$$

$$\boxed{x = \frac{9}{4}}$$

Score 0: The student made a conceptual error and a computational error.

Question 27

27 Graph $f(x) = \log_2(x + 6)$ on the set of axes below.

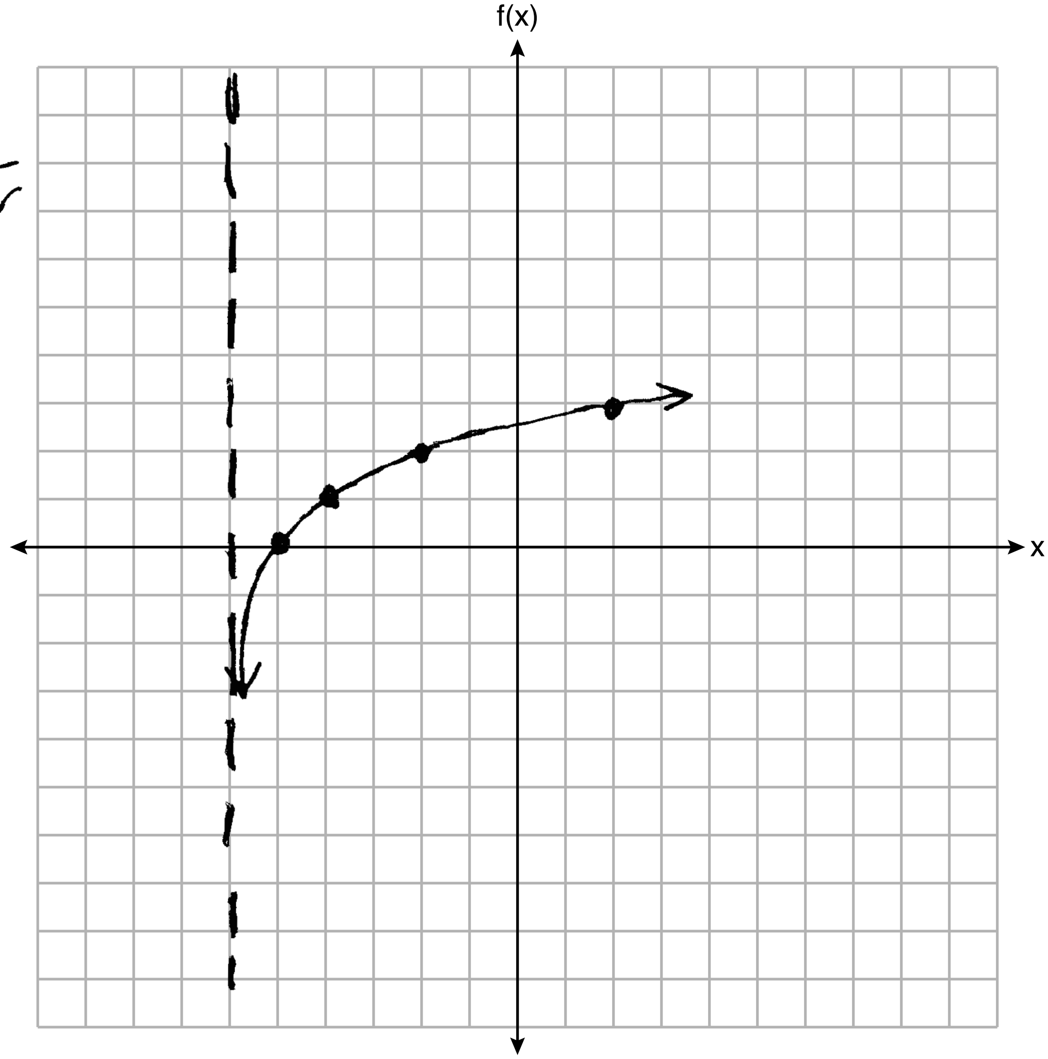


Score 2: The student gave a complete and correct response.

Question 27

27 Graph $f(x) = \log_2(x + 6)$ on the set of axes below.

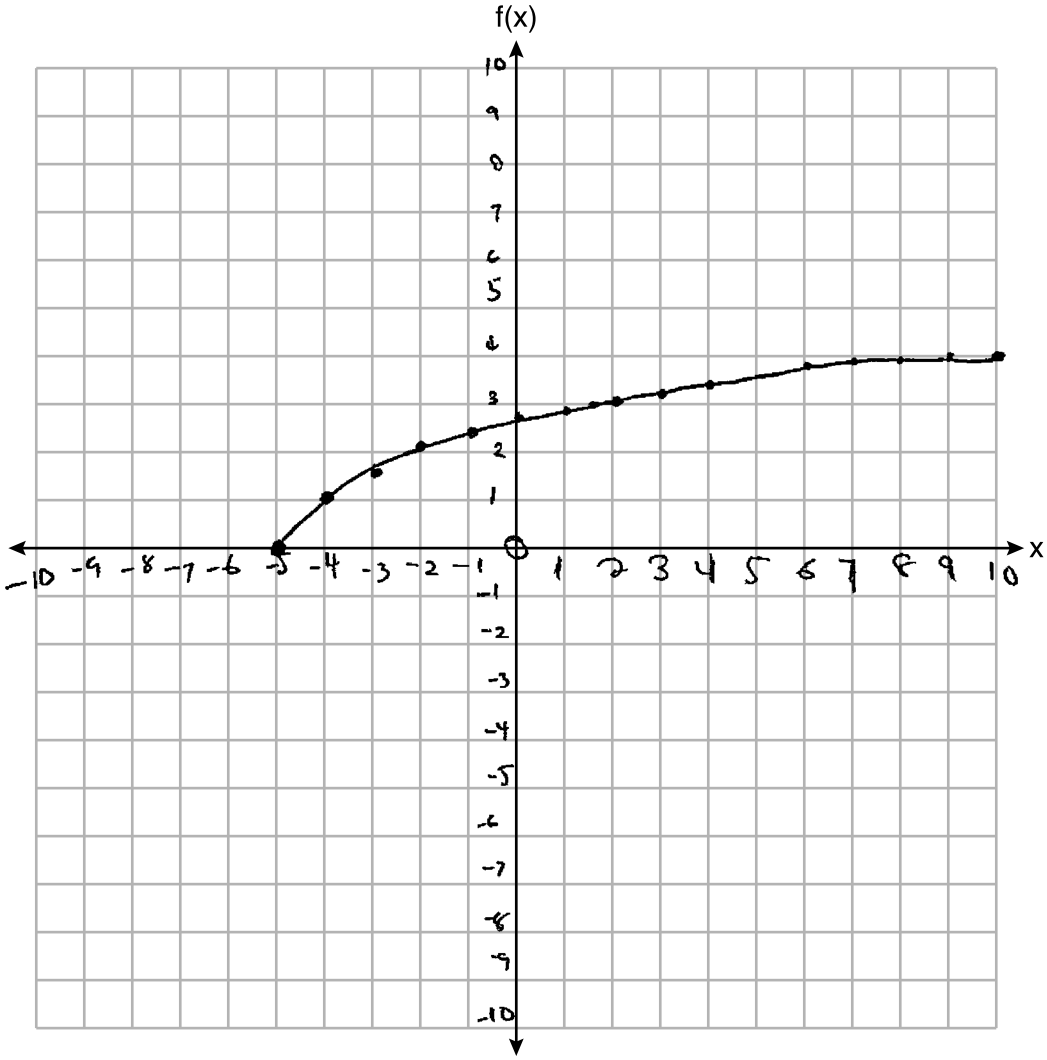
x	y
-6	Error
-5	0
-4	1
-2	2
2	3



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

Question 27

27 Graph $f(x) = \log_2(x + 6)$ on the set of axes below.



x	y
0	3
-5	0
-4	1
-2	2

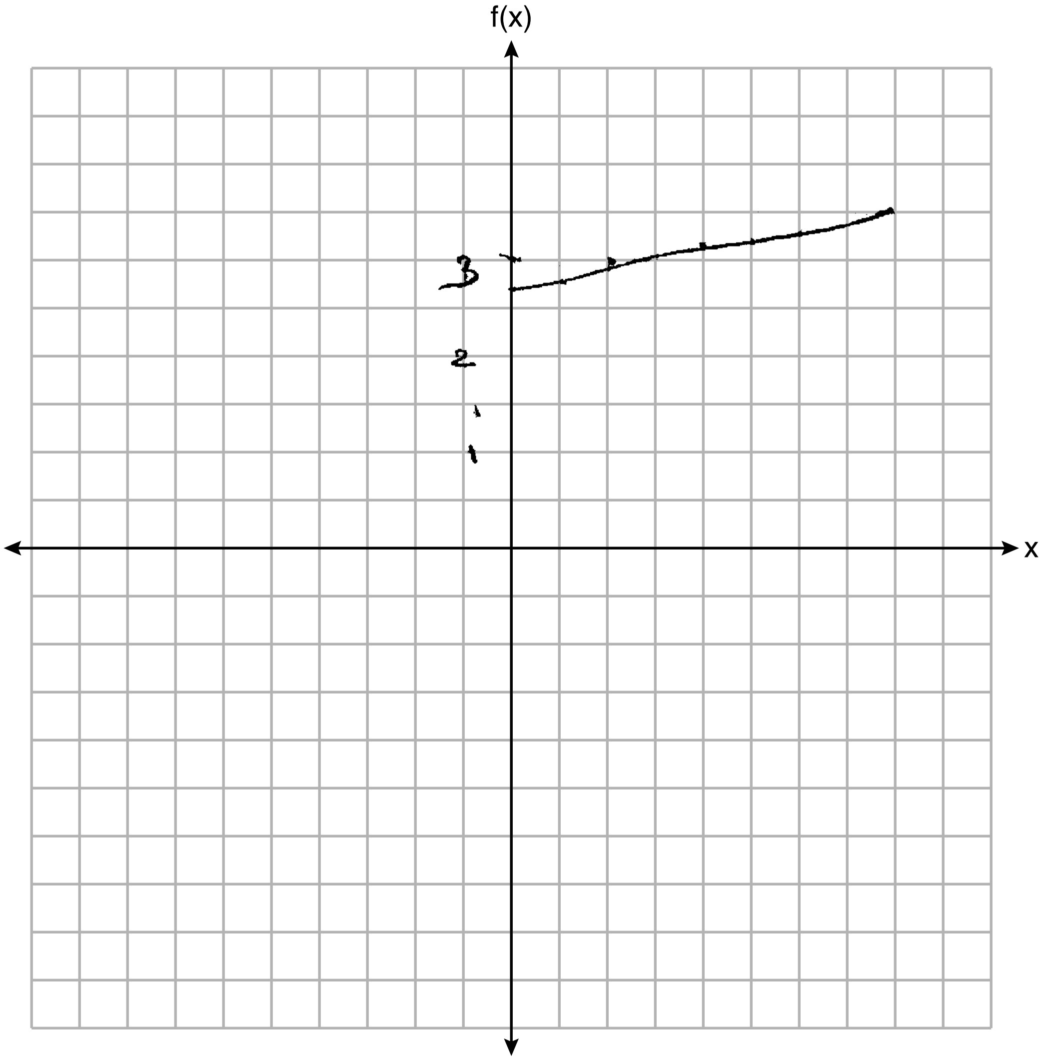
0 4 3

Score 1: The student made an error graphing the end behavior as $x \to -6$.

Question 27

27 Graph $f(x) = \log_2(x + 6)$ on the set of axes below.

x	y
0	2.5849
1	2.8073
2	3
3	3.1699
4	3.3219
5	3.4594
6	3.5849

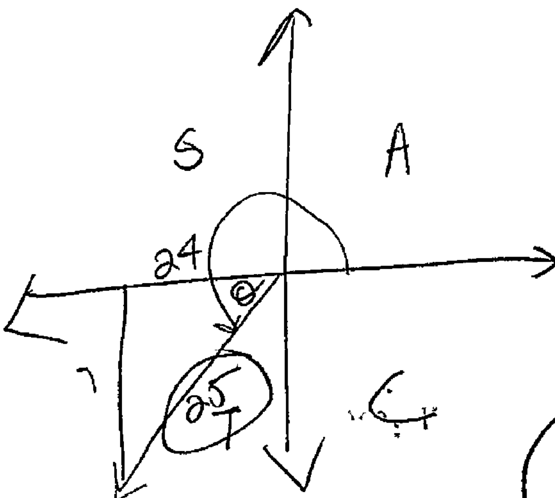


Score 0: The student made multiple graphing errors.

Question 28

28 Given $\tan\theta = \frac{7}{24}$, and θ terminates in Quadrant III, determine the value of $\cos\theta$.

SOH
CAH
TOA



$$-\frac{24}{25}$$

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

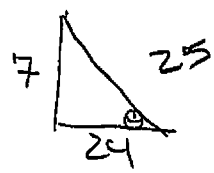
Question 28

28 Given $\tan \theta = \frac{7}{24}$, and θ terminates in Quadrant III, determine the value of $\cos \theta$.

SohCahToa

S A

T C



$7^2 + 24^2 = x^2$

$49 + 576 = x^2$

$\sqrt{625} = \sqrt{x^2}$

$x = 25$

$\boxed{-\frac{24}{25}}$

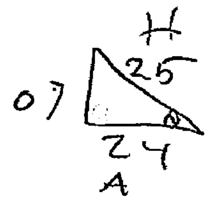
Score 2: The student gave a complete and correct response.

Question 28

28 Given $\tan\theta = \frac{7}{24}$, and θ terminates in Quadrant III, determine the value of $\cos\theta$.

SOH CAHTOA

$\cos Q = \frac{A}{H} = \boxed{\frac{24}{25}}$



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

$7^2+24^2=x^2$

$49+576=x^2$

$\sqrt{625}=\sqrt{x^2}$

$x=25$

Score 1: The student did not consider the quadrant.

28 Given $\tan\theta = \frac{7}{24}$, and θ terminates in Quadrant III, determine the value of $\cos\theta$.

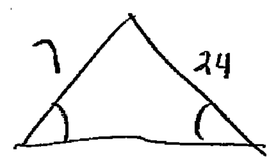
tan (+,-, +,-)

cos(+,-,-,+)

$y = mx + b$

$S\frac{O}{H}$ $C\frac{A}{H}$ $T\frac{O}{A}$

$\tan\theta = \frac{7}{24}$



$C\,\frac{a}{H}$ Tan =

$\boxed{\cos\theta = \frac{23}{24}}$

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

$7^2 = 24^2$

$49 = 576$

$-49 \quad -49$

$b^2 = 527$

$b = 23$

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

Question 29

29 Kenzie believes that for $x \geq 0$, the expression $\left(\sqrt[7]{x^2}\right)\left(\sqrt[5]{x^3}\right)$ is equivalent to $\sqrt[35]{x^6}$. Is she correct? Justify your response algebraically.

$$\left(x^{\frac{2}{7}}\right)\left(x^{\frac{3}{5}}\right) = x^{\frac{31}{35}} = \sqrt[35]{x^{31}}$$

she is not correct because when you convert the expression into radical form and multiply, add the exponents, the answer should be $\sqrt[35]{x^{31}}$

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

Question 29

29 Kenzie believes that for $x \geq 0$, the expression $\left(\sqrt[7]{x^2}\right)\left(\sqrt[5]{x^3}\right)$ is equivalent to $\sqrt[35]{x^6}$. Is she correct? Justify your response algebraically.

$\frac{2}{7} + \frac{3}{5} = \frac{31}{35}$

$x^{2/7} \cdot x^{3/5}$

$x^{31/35}$

$\sqrt[35]{x^{31}} \neq \sqrt[35]{x^6}$

Score 2: The student gave a complete and correct response. It is indicated that Kenzie is incorrect.

Question 29

29 Kenzie believes that for $x \geq 0$, the expression $\left(\sqrt[7]{x^2}\right)\left(\sqrt[5]{x^3}\right)$ is equivalent to $\sqrt[35]{x^6}$. Is she correct? Justify your response algebraically.

$(x)^{\frac{6}{35}}$

$(\sqrt[7]{x^2})(\sqrt[5]{x^3})$

$((x^2)^{\frac{1}{7}}) \cdot ((x^3)^{\frac{1}{5}})$

$(x^{\frac{2}{7}}) \cdot (x^{\frac{3}{5}})$

$(x)^{\frac{6}{35}}$

yes she is correct

Score 1: The student applied exponent properties incorrectly.

29 Kenzie believes that for $x \geq 0$, the expression $\left(\sqrt[7]{x^2}\right)\left(\sqrt[5]{x^3}\right)$ is equivalent to $\sqrt[35]{x^6}$. Is she correct? Justify your response algebraically.

$$\left(\sqrt[7]{(2)^2}\right)\left(\sqrt[5]{(2)^3}\right) = 1.84767919$$

$$\sqrt[35]{(2)^6} = 1.126173081$$

no, when plugging in a tester they are not the same

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

Question 29

29 Kenzie believes that for $x \geq 0$, the expression $\left(\sqrt[7]{x^2}\right)\left(\sqrt[5]{x^3}\right)$ is equivalent to $\sqrt[35]{x^6}$. Is she correct? Justify your response algebraically.

$$\sqrt[7]{x^2} = (x^2)^{\frac{7}{2}}$$

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

$$(x^2)^{\frac{7}{2}} \cdot (x^3)^{\frac{5}{2}} = x^{6\frac{35}{4}} = \left(\sqrt[35]{x^6}\right)^4$$

Score 0: The student made multiple errors.

Question 30

30 When the function $p(x)$ is divided by $x - 1$ the quotient is $x^2 + 7 + \frac{5}{x-1}$. State $p(x)$ in standard form.

$$\frac{P(x)}{x-1} = x^2 + 7 + \frac{5}{x-1}$$

$$x^2(x-1) + 7(x-1) + \left(\frac{5}{x-1}\right)(x-1)$$

$$x^3 - x^2 + 7x - 7 + 5$$

$$P(x) = x^3 - x^2 + 7x - 2$$

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

Question 30

30 When the function $p(x)$ is divided by $x - 1$ the quotient is $x^2 + 7 + \frac{5}{x - 1}$. State $p(x)$ in standard form.

x^2+7

$\times\ x-1$

$-x^2-7$

$x^3\ 7x$

$x^3-x^2+7x-7 \quad +5$

$x^3-x^2+7x-2.$

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

Question 30

30 When the function $p(x)$ is divided by $x - 1$ the quotient is $x^2 + 7 + \frac{5}{x - 1}$. State $p(x)$ in standard form.

$$\frac{p(x)}{x-1} = x^2 + 7 + \frac{5}{x-1}$$

$$\frac{(x-1)}{(x-1)}(x^2+7) + \frac{5}{x-1}$$

$$\frac{x^3 - x^2 + 7x - 7 + 5}{x-1}$$

$$\frac{x^3 - x^2 + 7x - 2}{x-1}$$

$$p(x) = x^3 - x^2 + 7x - 2$$

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

30 When the function $p(x)$ is divided by $x - 1$ the quotient is $x^2 + 7 + \frac{5}{x - 1}$. State $p(x)$ in standard form.

$x^3 - x^2 + 7x - 7 + 5x - 5$

$x^3 - x^2 + 12x - 12$

Score 1: The student incorrectly distributed the $x - 1$ to the rational term.

Question 30

30 When the function $p(x)$ is divided by $x - 1$ the quotient is $x^2 + 7 + \frac{5}{x - 1}$. State $p(x)$ in standard form.

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

$x-1(7) = \boxed{7x} \boxed{-7}$

$x^3 - x^2 + 7x - 7$

$$\begin{array}{r} x^2 \quad + 7 \\ x-1 \enclose{longdiv}{x^3 - \cancel{x^2} + 7x - 7} \\ -x^3 + x^2 \\ \hline -7x- \end{array}$$

Score 1: The student excluded the remainder.

Question 30

30 When the function $p(x)$ is divided by $x - 1$ the quotient is $x^2 + 7 + \frac{5}{x - 1}$. State $p(x)$ in standard form.

x^3+x^2

$x^2 + \frac{7x-7}{x-1} + \frac{5}{x-1}$

$x^3 + x^2 + 7x - 7 + 5$

Score 0: The student made an error distributing the x^2 and did not state $p(x)$ in standard form.

Question 31

31 Write a recursive formula for the sequence 6, 9, 13.5, 20.25, . . .

$a_1 = 6$

$a_n = a_{n-1} \cdot 1.5$

Check

$a_2 = a_{2-1} \cdot 1.5$

$a_2 = a_1 \cdot 1.5$

$a_2 = 6 \cdot 1.5$

$a_2 = 9$ ✓

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

$\frac{9\times3}{2\times2}$ $\frac{27}{4}$

31 Write a recursive formula for the sequence 6, 9, 13.5, 20.25, . . .

$a_1 = 6$

$a_n = a_{n-1} \cdot K$

$r = \frac{3}{2}$

$$\boxed{\begin{array}{l} a_n = a_{n-1} \cdot \frac{3}{2} \\ a_1 = 6 \end{array}}$$

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

Question 31

31 Write a recursive formula for the sequence 6, 9, 13.5, 20.25, . . .

$+3$ $r = \frac{3}{2}$

$a_1 = 6$

$a_n = a_1\left(\frac{3}{2}\right)^1$

Score 1: The student received credit for writing $a_1 = 6$.

Question 31

31 Write a recursive formula for the sequence 6, 9, 13.5, 20.25, . . .

$a_n = 1.5(a_{n-1})$

Score 1: The student did not write the initial term.

Question 31

31 Write a recursive formula for the sequence 6, 9, 13.5, 20.25, . . .

1.5 1.5 1.5

$\boxed{a_n = 6}$

$\boxed{a_n = 9, \quad 1.5}$

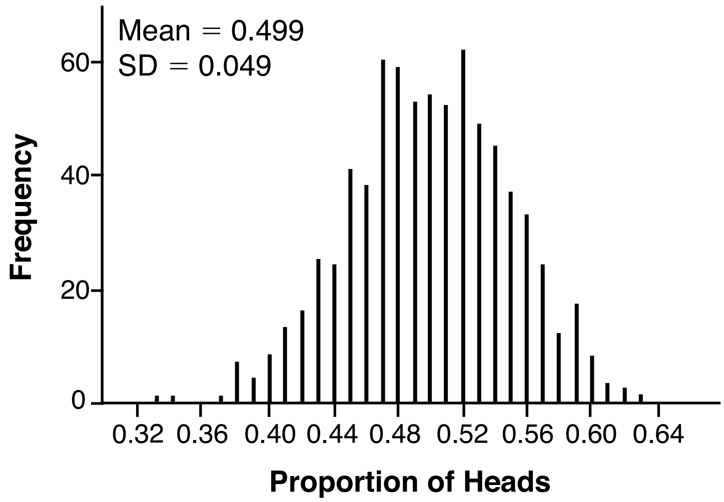
6, 9, 13.5, 20.25

1.5 1.5 1.5

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

Question 32

32 Robin flips a coin 100 times. It lands heads up 43 times, and she wonders if the coin is unfair. She runs a computer simulation of 750 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



Do the results of the simulation provide strong evidence that Robin's coin is unfair? Explain your answer.

Robins coin $= \frac{43}{100} = .43$

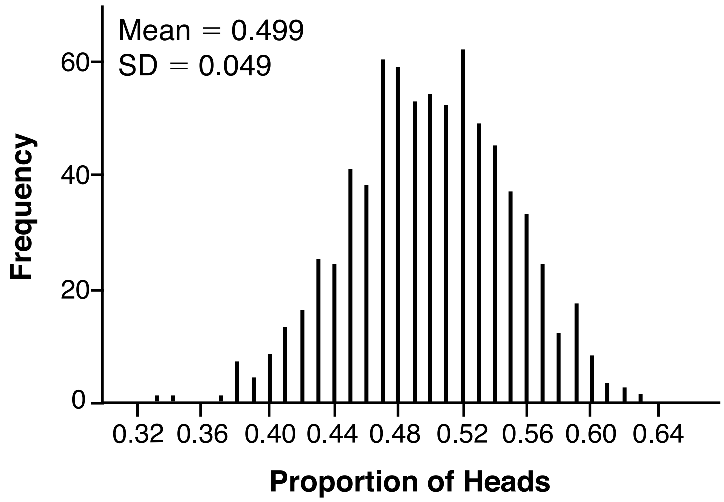
$.499 \pm 2(.049) \rightarrow (.401, .597)$

Since .43 is within the interval of (.401, .597) her coin is likely not unfair.

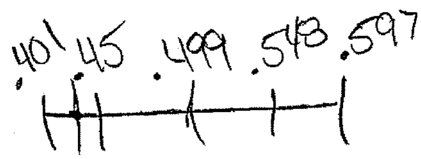
Score 2: The student gave a complete and correct response.

Question 32

32 Robin flips a coin 100 times. It lands heads up 43 times, and she wonders if the coin is unfair. She runs a computer simulation of 750 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



Do the results of the simulation provide strong evidence that Robin's coin is unfair? Explain your answer.



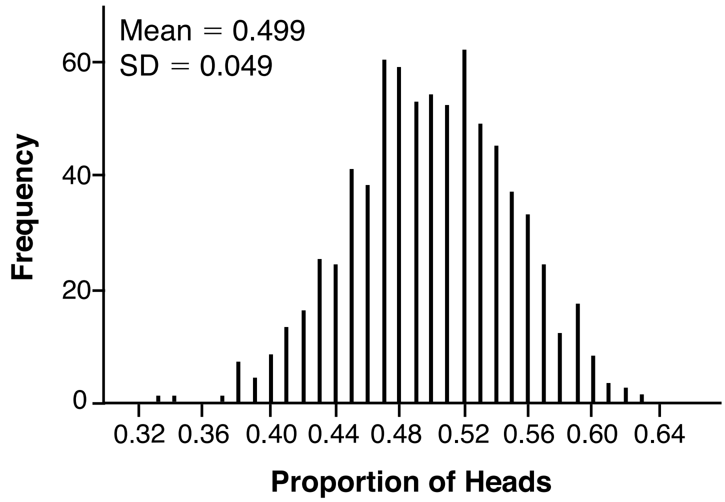
$\frac{43}{100} = .43$

NO becase .43 Falls inside the 95%/
2 Stundant deviation.

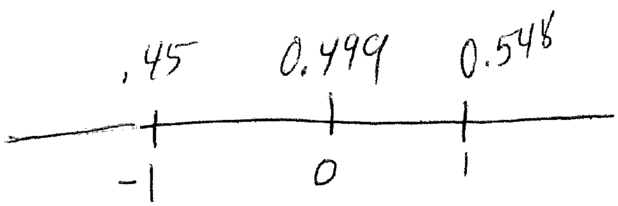
Score 2: The student gave a complete and correct response.

Question 32

32 Robin flips a coin 100 times. It lands heads up 43 times, and she wonders if the coin is unfair. She runs a computer simulation of 750 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



Do the results of the simulation provide strong evidence that Robin's coin is unfair? Explain your answer.



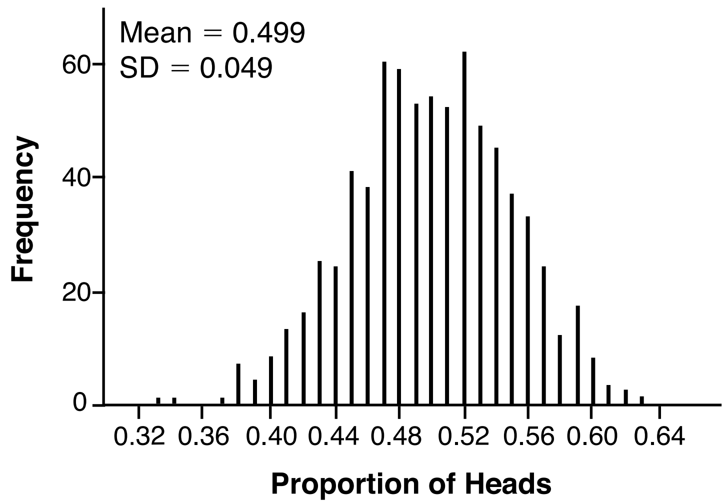
(.45, .548)

.43 is outside the interval so the simulation provides strong evidence Robin's coin is unfair.

Score 1: The student gave a correct explanation based on an inappropriate interval.

Question 32

32 Robin flips a coin 100 times. It lands heads up 43 times, and she wonders if the coin is unfair. She runs a computer simulation of 750 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



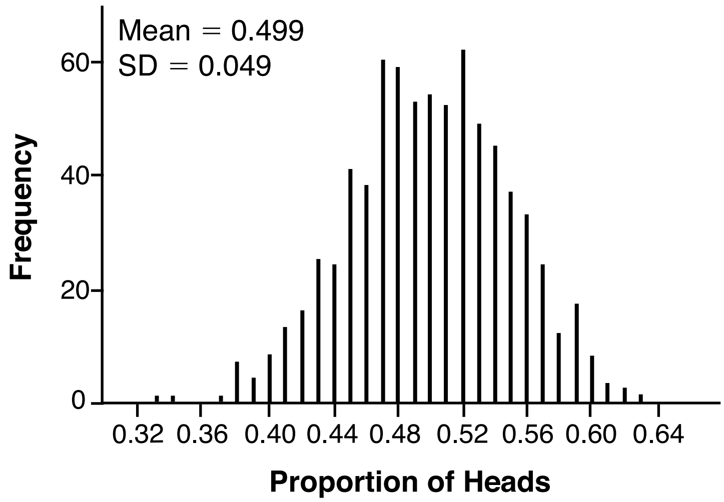
Do the results of the simulation provide strong evidence that Robin's coin is unfair? Explain your answer.

No, .43 is within 2 standard deviations from the mean.

Score 1: The student gave an explanation, but provided no statistical evidence.

Question 32

32 Robin flips a coin 100 times. It lands heads up 43 times, and she wonders if the coin is unfair. She runs a computer simulation of 750 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



Do the results of the simulation provide strong evidence that Robin's coin is unfair? Explain your answer.

Yes, her coin is more than 1 standard deviation away. Although it isn't more than 1.5 deviations, it is still much less than the mean.

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

Question 33

33 Factor completely over the set of integers: $16x^4 - 81$

$$16x^4 - 81$$
$$(4x^2+9)(4x^2-9)$$
$$\boxed{(4x^2+9)(2x+3)(2x-3)}$$

Sara graphed the polynomial $y = 16x^4 - 81$ and stated "All the roots of $y = 16x^4 - 81$ are real." Is Sara correct? Explain your reasoning.

~~$a=16 \quad b=0 \quad c=-81$~~

$$4x^2+9=0 \qquad 2x+3=0 \qquad 2x-3=0$$
$$-9 \quad -9$$
$$\sqrt{4x^2} = \sqrt{-9}$$

no, When you make mini equations, $4x^2+9=0$ can be solved for x, but your answer is an imaginary number, meaning not all roots of $y=16x^4-81=0$ are real.

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

Question 33

33 Factor completely over the set of integers: $16x^4 - 81$

$(4x^2-9)(4x^2+9)$

$\boxed{(2x-3)(2x+3)(4x^2+9)}$

Sara graphed the polynomial $y = 16x^4 - 81$ and stated "All the roots of $y = 16x^4 - 81$ are real." Is Sara correct? Explain your reasoning.

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

$2x-3=0$ | $2x+3=0$ | $4x^2+9=0$

$2x=3$ | $2x=-3$ | $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$x=\frac{3}{2}$ | $x=\frac{-3}{2}$ | $b^2-4ac=0^2-4(4)(9)=-144$

Sara is incorrect. although 2 of the roots are real, we know at least one root is nonreal because, when using the quadratic formula to determine the roots for the factor $4x^2+9$, the discriminant is negative.

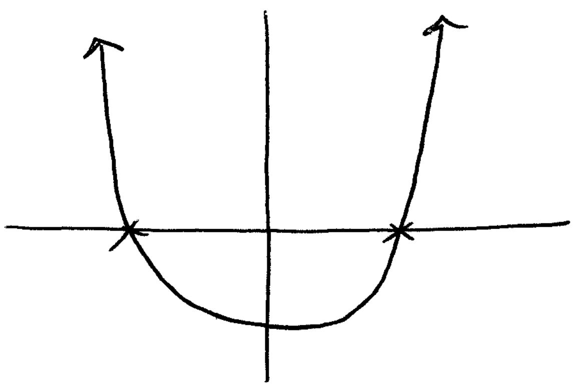
Score 4: The student gave a complete and correct response.

Question 33

33 Factor completely over the set of integers: $16x^4 - 81$

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

Sara graphed the polynomial $y = 16x^4 - 81$ and stated "All the roots of $y = 16x^4 - 81$ are real." Is Sara correct? Explain your reasoning.



No because the graph only crosses the x axis two times meaning only 2 real roots not 4.

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

Question 33

33 Factor completely over the set of integers: $16x^4 - 81$

$16x^4 - 81$

$(4x^2-9)(4x^2+9)$

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

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

$\frac{16}{\ }$

1, 2, 4, 8, 16

Sara graphed the polynomial $y = 16x^4 - 81$ and stated "All the roots of $y = 16x^4 - 81$ are real." Is Sara correct? Explain your reasoning.

NO. Because it has 4 possible zeros, but only crosses the x-axis twice. (Graphing calculater)

Score 3: The student made one factoring error.

Question 33

33 Factor completely over the set of integers: $16x^4 - 81$

$(4x^2-9)(4x^2+9)$

$4x^2-9=0$
$+9\quad +9$

$\frac{4x^2}{4}=\frac{9}{4}$

$\sqrt{x^2}=\sqrt{\frac{9}{4}}=\boxed{x=\pm 3/2}$

$4x^2+9=0$
$-9\quad -9$

$\frac{4x^2}{4}=\frac{-9}{4}$

$\sqrt{x^2}=\sqrt{-\frac{9}{4}}$

$\boxed{x=\pm 3/2\, i}$

Sara graphed the polynomial $y = 16x^4 - 81$ and stated "All the roots of $y = 16x^4 - 81$ are real." Is Sara correct? Explain your reasoning.

Not all of the roots of $16x^4-81$ are real, because if it would be real it wouldn't had an imaginary number

Score 3: The student did not factor completely.

Question 33

33 Factor completely over the set of integers: $16x^4 - 81$

$(4x^2 - 9)(4x^2 + 9)$

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

Sara graphed the polynomial $y = 16x^4 - 81$ and stated "All the roots of $y = 16x^4 - 81$ are real." Is Sara correct? Explain your reasoning.

roots: $\frac{-3}{2}, \frac{3}{2}, \frac{3i}{2}, \frac{-3i}{2}$

No, b/c $\frac{3i}{2}$ and $\frac{-3i}{2}$ are imaginary #'s

Score 3: The student did not factor over the set of integers.

33 Factor completely over the set of integers: $16x^4 - 81$

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

$\boxed{16x^4 - 81}$

$(4x^2+9)\ (4x^2-9)$

$2x+3 \quad 2x-3$

Sara graphed the polynomial $y = 16x^4 - 81$ and stated "All the roots of $y = 16x^4 - 81$ are real." Is Sara correct? Explain your reasoning.

Sara is incorrect because if you plug into y= and go to 2nd graph to the table and scroll up you can see there are some un real roots.

-17	1.34e6
-16	1.05e6
-15	809919
-14	614575

Score 2: The student only received credit for factoring completely.

Question 33

33 Factor completely over the set of integers: $16x^4 - 81$

$16x^4 - 81$

$(4x^2 - 9)(4x^2 + 9)$

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

Sara graphed the polynomial $y = 16x^4 - 81$ and stated "All the roots of $y = 16x^4 - 81$ are real." Is Sara correct? Explain your reasoning.

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

$2x - 3 = 0 \qquad 2x + 3 = 0$

$2x = 3 \qquad 2x = -3$

$x = \frac{3}{2} \qquad x = \frac{-3}{2}$

No, because 1.5 is a real number because -1.5 is not a real number because it is negative

Score 1: The student made one factoring error and gave an incorrect explanation.

Question 33

33 Factor completely over the set of integers: $16x^4 - 81$

$16x^4 - 81$

Sara graphed the polynomial $y = 16x^4 - 81$ and stated "All the roots of $y = 16x^4 - 81$ are real." Is Sara correct? Explain your reasoning.

Sarah is incorrect because some of the roots are imaginery.

Score 0: The student's explanation was not sufficient to receive any credit.

Question 34

34 The half-life of a radioactive substance is 15 years.

Write an equation that can be used to determine the amount, $s(t)$, of 200 grams of this substance that remains after t years.

$$s(t) = 200\left(\frac{1}{2}\right)^{\frac{t}{15}}$$

Determine algebraically, to the *nearest year*, how long it will take for $\frac{1}{10}$ of this substance to remain.

$$\frac{20}{200} = \frac{200\left(\frac{1}{2}\right)^{\frac{t}{15}}}{200}$$

$$\frac{1}{10} = \left(\frac{1}{2}\right)^{\frac{t}{15}}$$

$$\log\left(\frac{1}{10}\right) = \frac{t}{15}\log\left(\frac{1}{2}\right)$$

$$3.32193 = \frac{t}{15}$$

$$49.8289 = t$$

50. years

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

Question 34

34 The half-life of a radioactive substance is 15 years.

Write an equation that can be used to determine the amount, $s(t)$, of 200 grams of this substance that remains after t years.

$$S(t) = 200\left(\tfrac{1}{2}\right)^{t/15}$$

Determine algebraically, to the *nearest year*, how long it will take for $\frac{1}{10}$ of this substance to remain.

$$\frac{1}{10} = 200\left(\tfrac{1}{2}\right)^{t/15}$$

$$\frac{1}{2000} = \left(\tfrac{1}{2}\right)^{t/15}$$

$$\log\left(\frac{1}{2000}\right) = t/15 \log\left(\tfrac{1}{2}\right)$$

$t = 164$ years

Score 3: The student made an error assuming that $\frac{1}{10}$ of a gram of the substance remained.

Question 34

34 The half-life of a radioactive substance is 15 years.

Write an equation that can be used to determine the amount, $s(t)$, of 200 grams of this substance that remains after t years.

$s(t) = 200(.5)^t$

Determine algebraically, to the *nearest year*, how long it will take for $\frac{1}{10}$ of this substance to remain.

$s(t) = 200(0.5)^t$

$\frac{1}{10} \cdot 200 = 20$

$\frac{20}{200} = \frac{200(0.5)^t}{200}$

$.1 = (0.5)^t$

$\frac{\log .1}{\log 0.5} = \frac{t \log 0.5}{\log 0.5}$

$t = 3.32 \rightarrow$ ~~3 years~~

$3.32 \cdot 15 = 49.82$

$49.82 \rightarrow 50$

$\boxed{50 \text{ years}}$

Score 3: The student made an error writing the equation for $s(t)$, assuming t was the number of half-lives.

Question 34

34 The half-life of a radioactive substance is 15 years.

Write an equation that can be used to determine the amount, $s(t)$, of 200 grams of this substance that remains after t years.

$$s(t) = 200\left(\tfrac{1}{2}\right)^t$$

Determine algebraically, to the *nearest year*, how long it will take for $\frac{1}{10}$ of this substance to remain.

$$\frac{\frac{1}{10}}{200} = \frac{200\left(\frac{1}{2}\right)^t}{200}$$

$$\log\frac{1}{2000} = \log\tfrac{1}{2}^t$$

$$\frac{\log\frac{1}{2000}}{\log\frac{1}{2}} = \frac{t\log\frac{1}{2}}{\log\frac{1}{2}}$$

$$t = 10.96578428$$

$$\boxed{11 \text{ years}}$$

Score 2: The student wrote an incorrect equation and made an error assuming $\frac{1}{10}$ of a gram of the substance remained.

Question 34

34 The half-life of a radioactive substance is 15 years.

Write an equation that can be used to determine the amount, $s(t)$, of 200 grams of this substance that remains after t years.

200

$\frac{100 = 200(1-r)^{15}}{200}$

$200(1-r)^{t}$

$200(1-.045)^{t}$

Determine algebraically, to the *nearest year*, how long it will take for $\frac{1}{10}$ of this substance to remain.

$.5 = (1-r)^{15}$

$r = .04516$

$\frac{20 = 200(1-.045)^{x}}{200}$

$.1 = (.955)^{x}$

$x = 50$

It will take 50 years to only have $\frac{1}{10}$ of the substance to remain.

Score 1: The student received no credit for the first part and showed incomplete algebraic work on the second part.

Question 34

34 The half-life of a radioactive substance is 15 years.

Write an equation that can be used to determine the amount, $s(t)$, of 200 grams of this substance that remains after t years.

$$s(t) = 200\left(\frac{1}{2}\right)^{15t}$$

Determine algebraically, to the *nearest year*, how long it will take for $\frac{1}{10}$ of this substance to remain.

$$s(t) = 200\left(\frac{1}{2}\right)^{15\left(\frac{1}{10}\right)} \rightarrow 71 \text{ years}$$

Score 1: The student received 1 credit for the equation.

Question 34

34 The half-life of a radioactive substance is 15 years.

Write an equation that can be used to determine the amount, $s(t)$, of 200 grams of this substance that remains after t years.

$$S(t) = 200(1 - .15)^t$$

Determine algebraically, to the *nearest year*, how long it will take for $\frac{1}{10}$ of this substance to remain.

$$= 200(.85)^t,$$

$$\frac{200}{10} = \frac{20}{20}$$

$$\frac{20g}{200} = \frac{200(.85)^t}{200}$$

$$.1 = .85^t$$

$$\log .1\, t = \log .85$$

$$\boxed{13 \text{ years}}$$

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

Question 35

35 Determine an equation for the parabola with focus (4, −1) and directrix $y = -5$. (Use of the grid below is optional.)

	x	-4
x	x^2	$-4x$
-4	$-4x$	16

	y	1
y	y^2	y
1	y	1

	y	5
y	y^2	$5y$
5	$5y$	25

$$\left(\sqrt{(x-4)^2+(y+1)^2}\right)^2=(y+5)^2$$

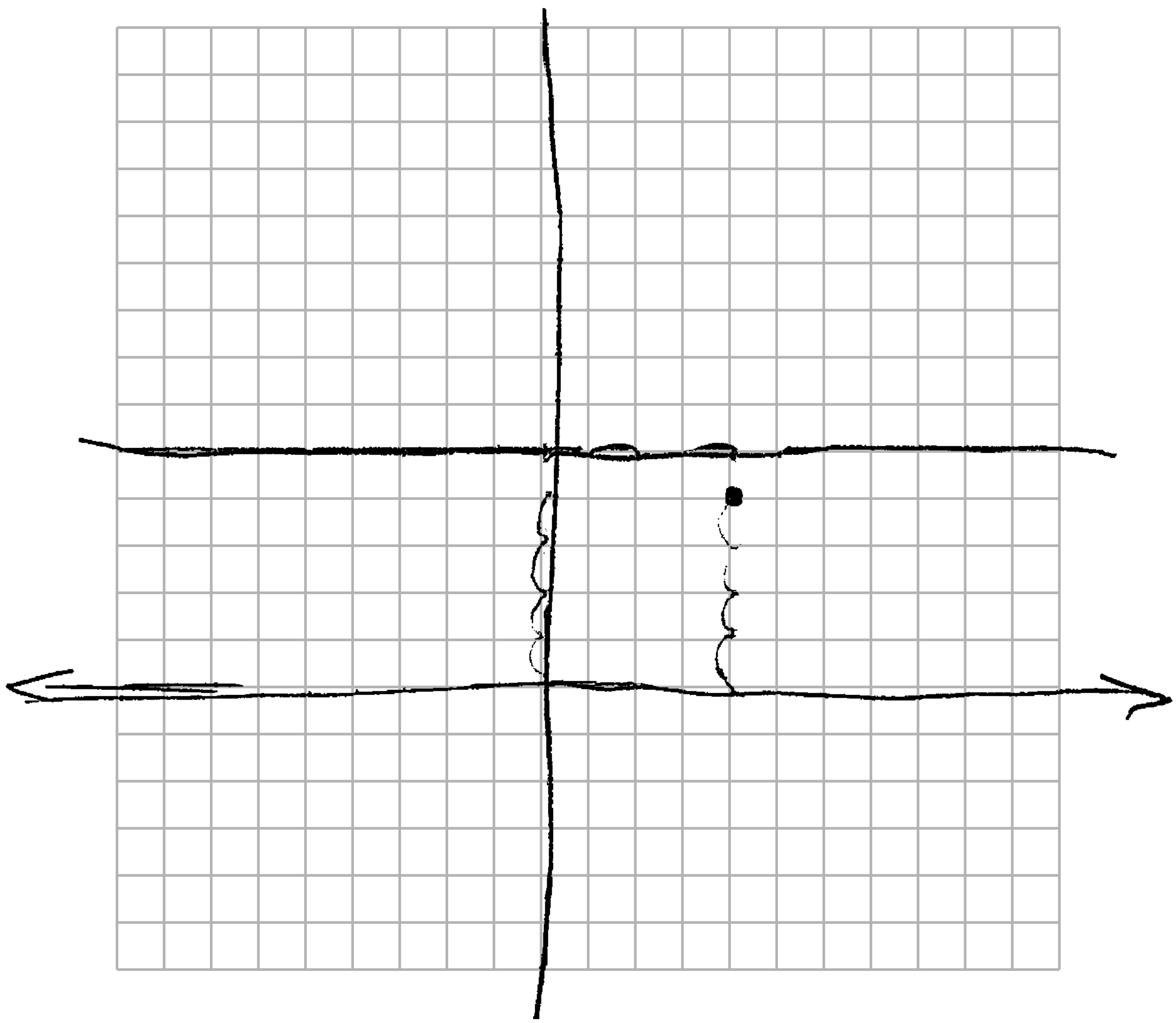
$$x^2-8x+16+\cancel{y^2}+2y+1=\cancel{y^2}+10y+25$$

$$-2y-25 \qquad -2y-25$$

$$x^2-8x+16-24=8y$$

$$\frac{x^2}{8}-\frac{8x}{8}-\frac{8}{8}=\frac{8y}{8}$$

$$y=\frac{1}{8}x^2-x-1$$



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

Question 35

35 Determine an equation for the parabola with focus (4, −1) and directrix $y = -5$. (Use of the grid below is optional.)

$$y = \frac{1}{2(-1-(-5))}(x-4)^2 + \frac{-1+(-5)}{2}$$

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

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

Question 35

35 Determine an equation for the parabola with focus $(4, -1)$ and directrix $y = -5$. (Use of the grid below is optional.)

vertex $= {}^-5 + {}^-1 = \frac{-6}{2} = {}^-3$

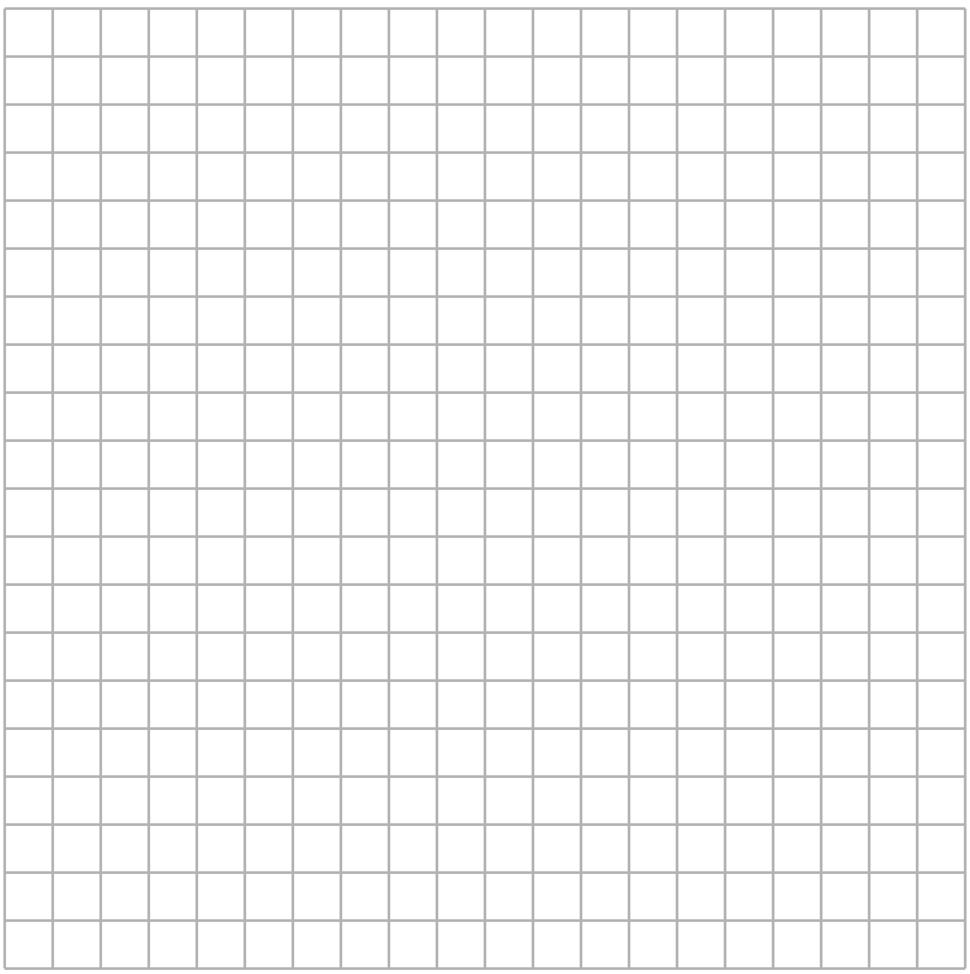
$y = {}^-3$

$x = 4$

vertex $= (4, {}^-3)$

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

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

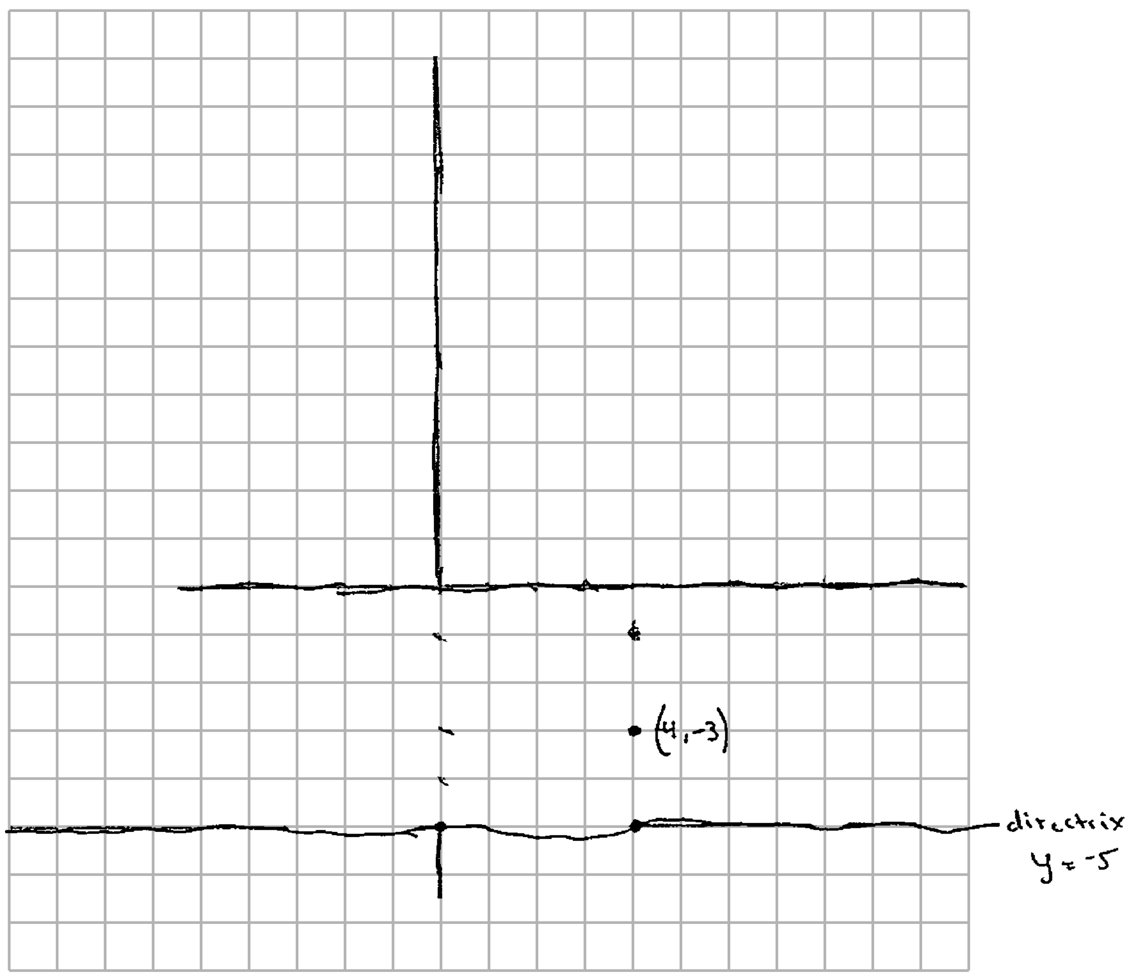


Score 3: The student used an incorrect value for p.

Question 35

35 Determine an equation for the parabola with focus $(4, -1)$ and directrix $y = -5$. (Use of the grid below is optional.)

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



Score 2: The student correctly found the vertex and received 1 credit for the equation.

Question 35

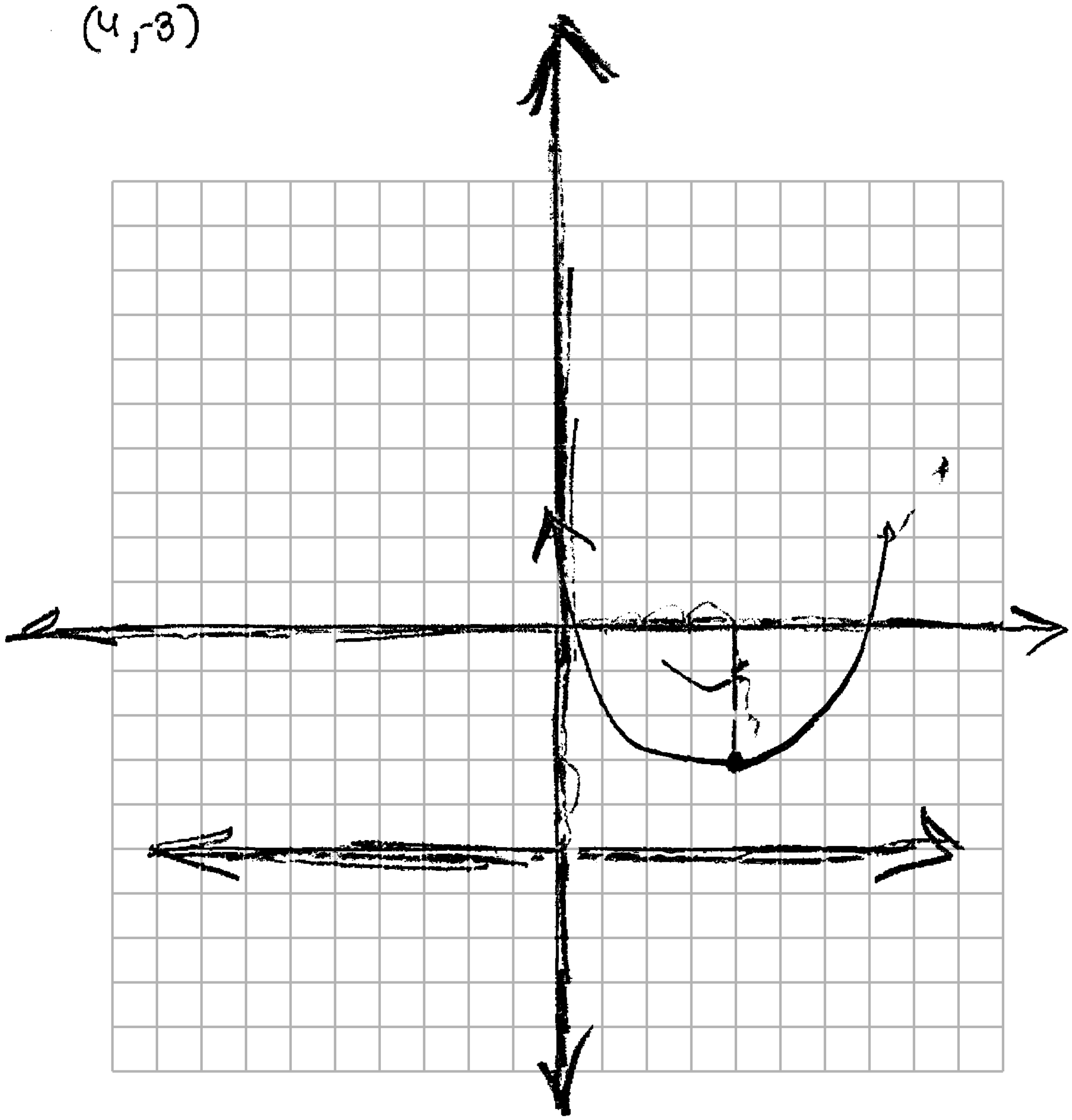
35 Determine an equation for the parabola with focus (4, −1) and directrix $y = -5$.
(Use of the grid below is optional.)

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

$\boxed{y = \frac{1}{8}(x-4) - 3}$

(h, k)

$(4, -3)$

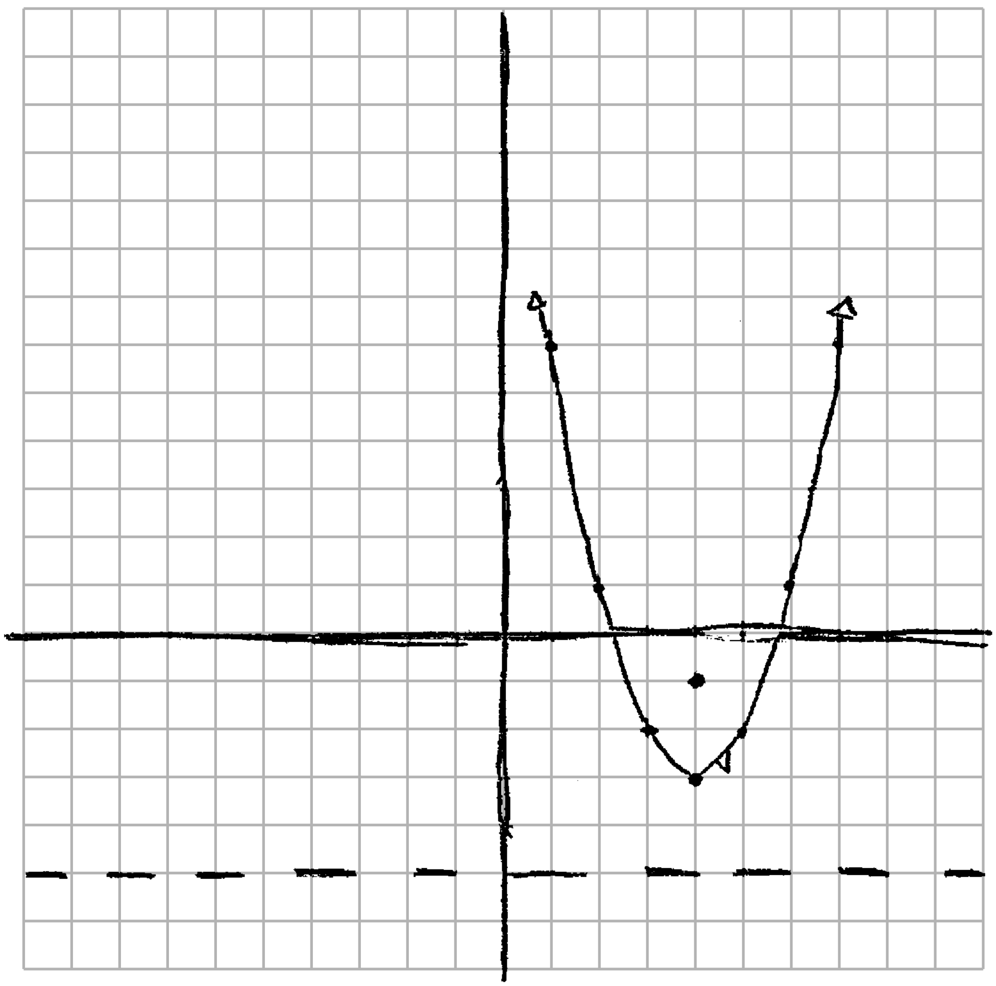


Score 2: The student correctly found the vertex and received 1 credit for the equation.

Question 35

35 Determine an equation for the parabola with focus $(4, -1)$ and directrix $y = -5$. (Use of the grid below is optional.)

$$\boxed{f(x) = (x^2 - 4) - 3}$$



Score 1: The student correctly found the vertex, but made multiple errors writing the equation.

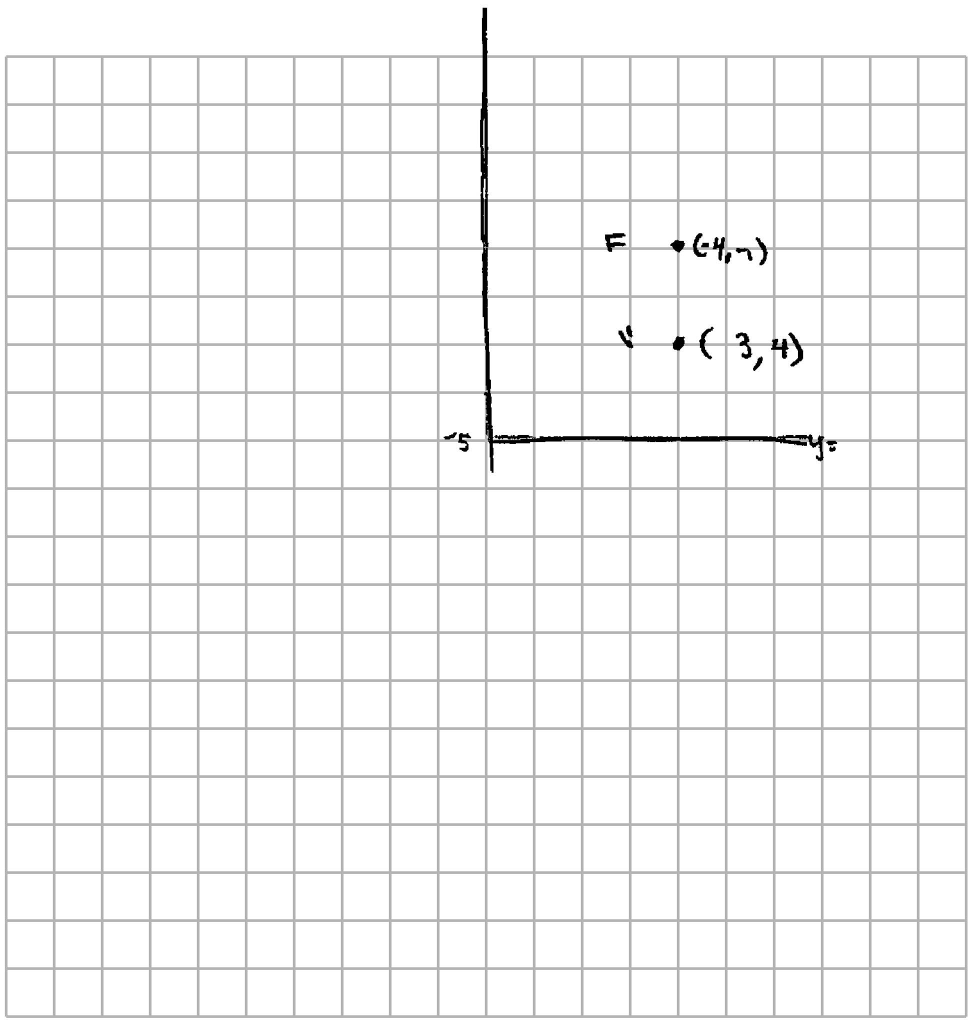
Question 35

35 Determine an equation for the parabola with focus (4, −1) and directrix $y = -5$. (Use of the grid below is optional.)

$y = \frac{1}{8}(x-4)-5$

$\frac{1}{4p\,2} =$

$p=2 \quad \frac{1}{8}$



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

Question 36

36 Juan and Filipe practice at the driving range before playing golf. The number of wins and corresponding practice times for each player are shown in the table below.

	Juan Wins	Filipe Wins
Short Practice Time	8	10
Long Practice Time	15	12

$\underbrace{15 \quad 12}_{27}$

22
+23
45

Given that the practice time was long, determine the exact probability that Filipe wins the next match.

$$P(F|L) = \frac{12}{27}$$

Determine whether or not the two events "Filipe wins" and "long practice time" are independent. Justify your answer.

$$P(F|L) \neq P(F)$$

$$\frac{12}{27} \neq \frac{22}{45}$$

$$.\overline{44} \neq .48\overline{8}$$

$\boxed{\text{not independent}}$

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

Question 36

36 Juan and Filipe practice at the driving range before playing golf. The number of wins and corresponding practice times for each player are shown in the table below.

	Juan Wins	Filipe Wins	
Short Practice Time	8	10	18
Long Practice Time	15	12	27
	23	22	45

Given that the practice time was long, determine the exact probability that Filipe wins the next match.

$$P(F|L) = \frac{12}{27}$$

Determine whether or not the two events "Filipe wins" and "long practice time" are independent. Justify your answer.

$$P(F \text{ AND } L) \stackrel{?}{=} P(F) \cdot P(L)$$

$$\frac{12}{45} \stackrel{?}{=} \frac{22}{45} \cdot \frac{27}{45}$$

$$.2667 \stackrel{?}{\neq} .2933$$

No, the two events are Not Independent

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

36 Juan and Filipe practice at the driving range before playing golf. The number of wins and corresponding practice times for each player are shown in the table below.

		J	F	
		Juan Wins	**Filipe Wins**	
S	**Short Practice Time**	8	10	18
S^c	**Long Practice Time**	15	12	27
		23	22	45

Given that the practice time was long, determine the exact probability that Filipe wins the next match.

$$P(F|S^c) = \frac{P(F \cap S^c)}{P(S^c)} = \frac{12/45}{27/45} = 0.160 \quad \text{(or } 16\%\text{)}$$

Determine whether or not the two events "Filipe wins" and "long practice time" are independent. Justify your answer.

$$P(F \cap S^c) \stackrel{?}{=} P(F) \cdot P(S^c)$$

$$\frac{12}{45} \stackrel{?}{=} \left(\frac{22}{45}\right)\left(\frac{27}{45}\right)$$

$$0.267 \neq 0.293$$

not independent

Score 3: The student made a computational error finding $p(f|s^c)$.

Question 36

36 Juan and Filipe practice at the driving range before playing golf. The number of wins and corresponding practice times for each player are shown in the table below.

	Juan Wins	Filipe Wins	
Short Practice Time	8	10	18
Long Practice Time	15	12	27
	23	22	$\boxed{45}$

Given that the practice time was long, determine the exact probability that Filipe wins the next match.

$P(F|L) = \frac{12}{27}$

$= .44$

Determine whether or not the two events "Filipe wins" and "long practice time" are independent. Justify your answer.

$P(A) = P(A|B)$

$P(f) \stackrel{?}{=} P(F|B)$

$\frac{22}{45} = .44$

$.48 \neq .44$

not independent

Score 3: The student made an error rounding to 0.48.

36 Juan and Filipe practice at the driving range before playing golf. The number of wins and corresponding practice times for each player are shown in the table below.

	Juan Wins	Filipe Wins
Short Practice Time	8	10
Long Practice Time	15	12

Given that the practice time was long, determine the exact probability that Filipe wins the next match.

$\frac{12}{15+12} \rightarrow \boxed{\frac{12}{27}}$

Determine whether or not the two events "Filipe wins" and "long practice time" are independent. Justify your answer.

The events of "Filipe wins" and "long practice" are dependent on one another because as "long practices" are done, the less times the evens of "Filipe wins".

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

Question 36

36 Juan and Filipe practice at the driving range before playing golf. The number of wins and corresponding practice times for each player are shown in the table below.

	Juan Wins	Filipe Wins
Short Practice Time	8	10
Long Practice Time	15	12

Given that the practice time was long, determine the exact probability that Filipe wins the next match.

$$\frac{12}{27}$$

Determine whether or not the two events "Filipe wins" and "long practice time" are independent. Justify your answer.

$$\frac{22}{45} = \frac{18}{27}$$

NO because they are different %

Score 1: The student received one credit for $\frac{12}{27}$.

36 Juan and Filipe practice at the driving range before playing golf. The number of wins and corresponding practice times for each player are shown in the table below.

	Juan Wins	Filipe Wins
Short Practice Time	8	10
Long Practice Time	15	12+1=13

23 22

18 + 1 = 19

27 + 1 = 28

Given that the practice time was long, determine the exact probability that Filipe wins the next match.

Probability that filipe wins the next match is 13/28

Determine whether or not the two events "Filipe wins" and "long practice time" are independent. Justify your answer.

12/27 = .444 ≈ .44%

They're indeoendent to each other because they don't have the same proportion, it's only a 44.% between them.

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

37 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire.

Determine the period of $f(t)$.

$BP = 2\pi$ $\quad B = .8\pi$

$(P).8\pi = 2\pi$

$P = 2.5$

Interpret what the period represents in this context.

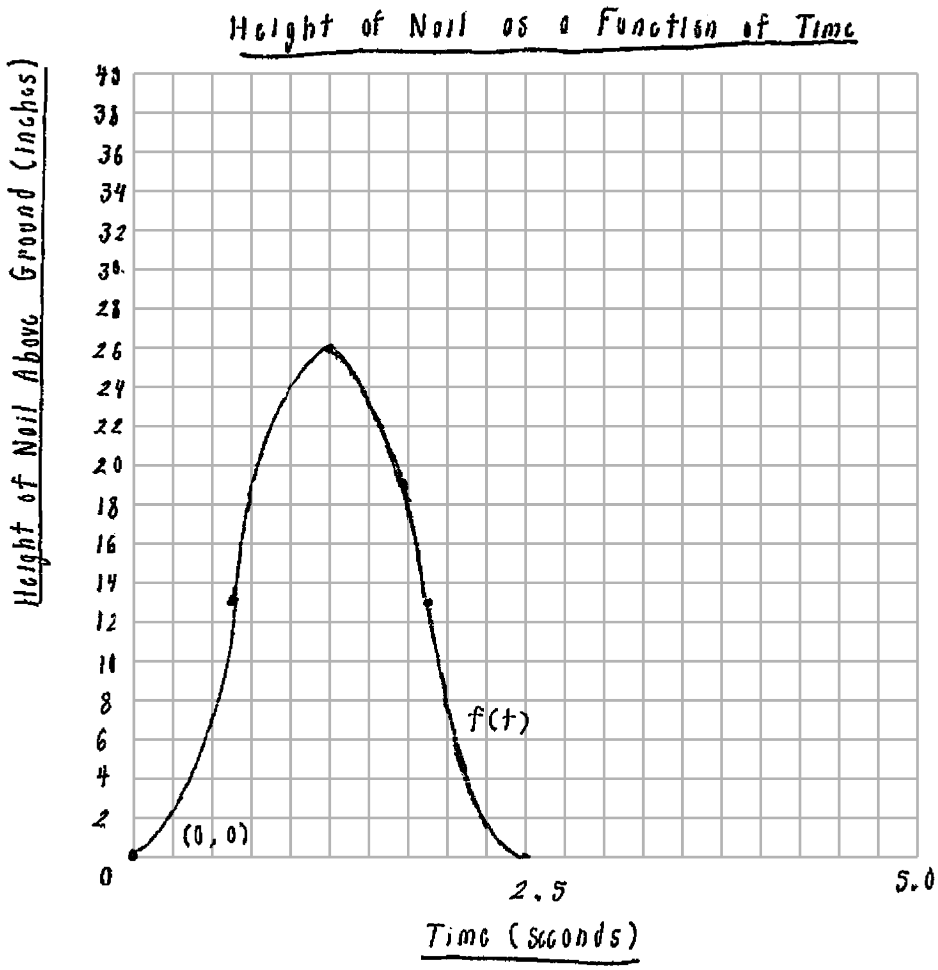
The period of f(t) represents the amount of time it would take the tire to spin one full rotation

Question 37 is continued on the next page.

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

Question 37 continued.

On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

No because at its max height, the tire can only reach 26 feet, as proven through adding the absolute value of a (13) to d (the midline, 13).

Question 37

37 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire.

Determine the period of $f(t)$.

period $= \frac{2\pi}{B}$

$\frac{2\pi}{0.8\pi}$

2.5 seconds

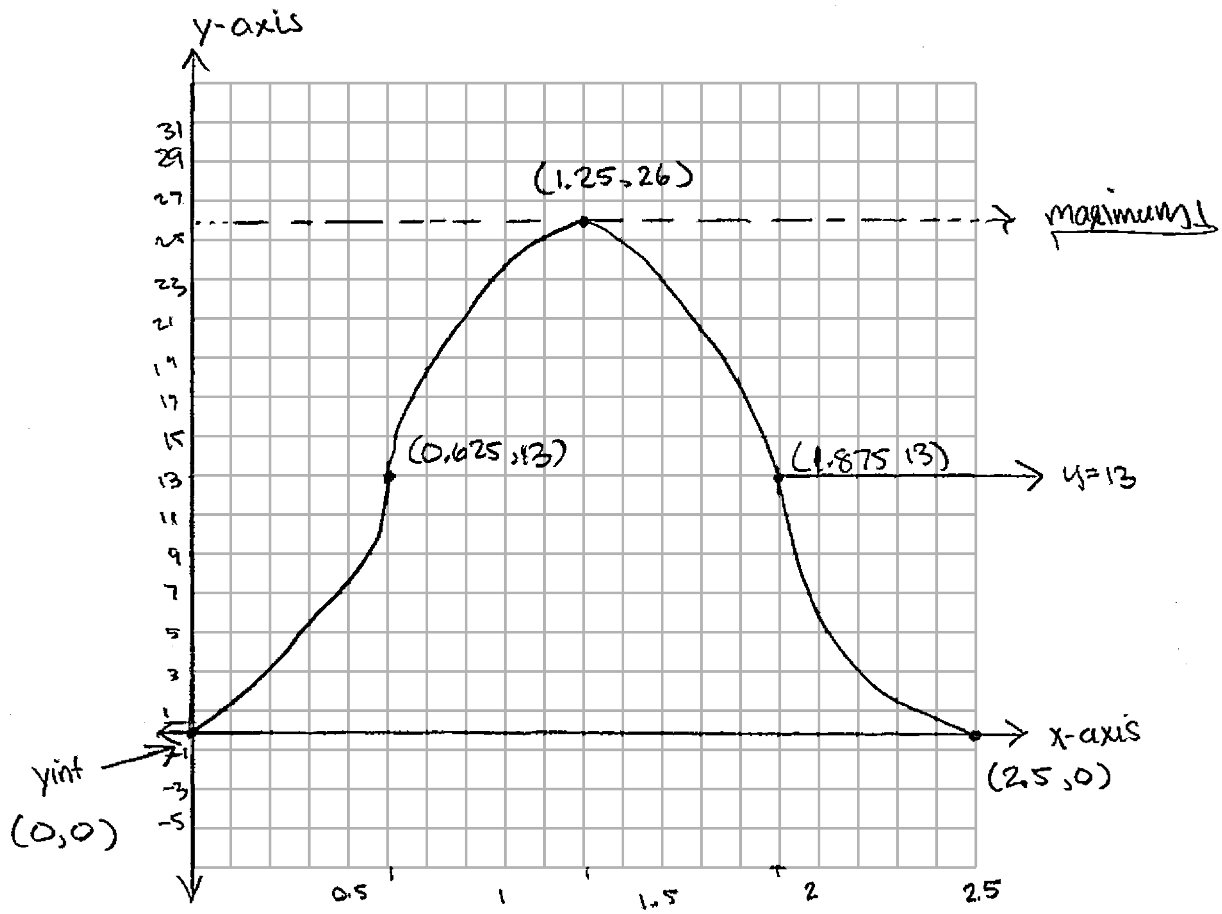
Interpret what the period represents in this context.

period is the time it takes for the nail to make one rotation

Question 37 is continued on the next page.

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

On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

No, the maximum of the sinusoidal curve is 26.

Question 37

37 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire.

Determine the period of $f(t)$.

period is 2.5,

Interpret what the period represents in this context.

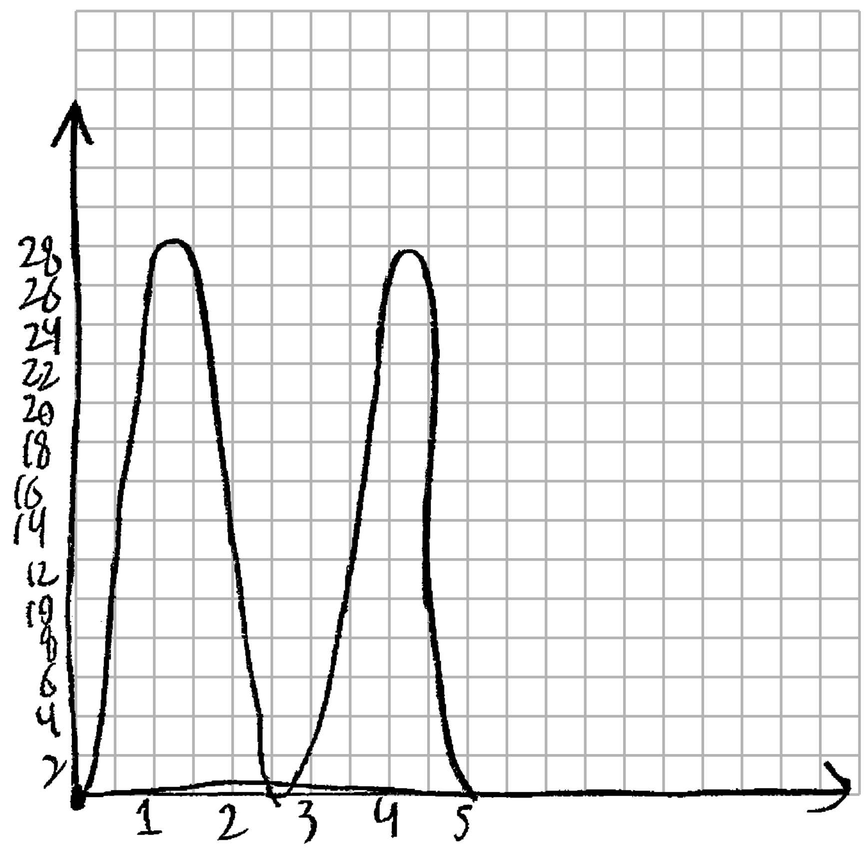
It takes 2.5 seconds for the nail
to do a full revolution on the tire

Question 37 is continued on the next page.

Score 5: The student made one graphing error.

Question 37 continued.

On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

No, it peaks at 28 inches

Question 37

37 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire.

A B C

Determine the period of $f(t)$.

$$\frac{P(\cancel{0.8\pi})}{\cancel{0.8\pi}} = \frac{2\pi}{0.8\pi} \qquad Pb = 2\pi$$

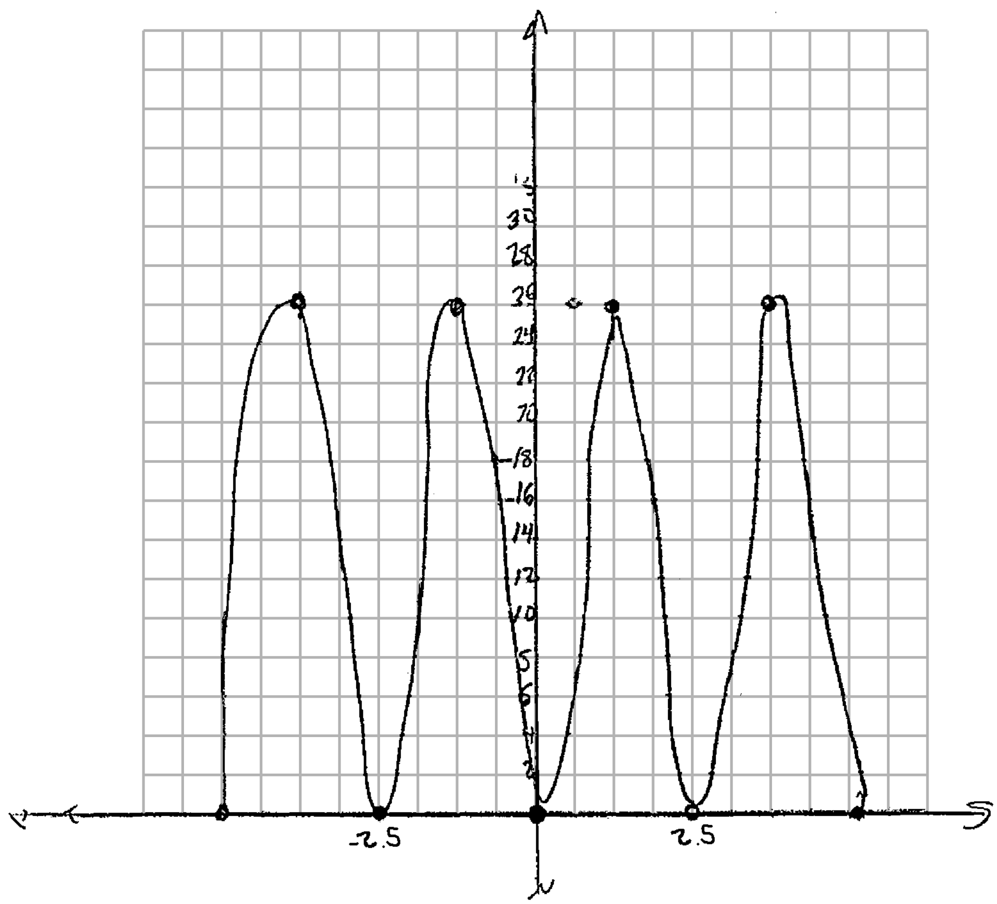
$$P = 2.5$$

Interpret what the period represents in this context.

Question 37 is continued on the next page.

Score 4: The student did not interpret the period and gave an incomplete justification in the last part.

On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

No it does not because the cosine graphs amplitude is 13 and the midline is 13

Question 37

37 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire.

Determine the period of $f(t)$.

$\frac{2\pi}{.8\pi} = 2.5$ seconds,

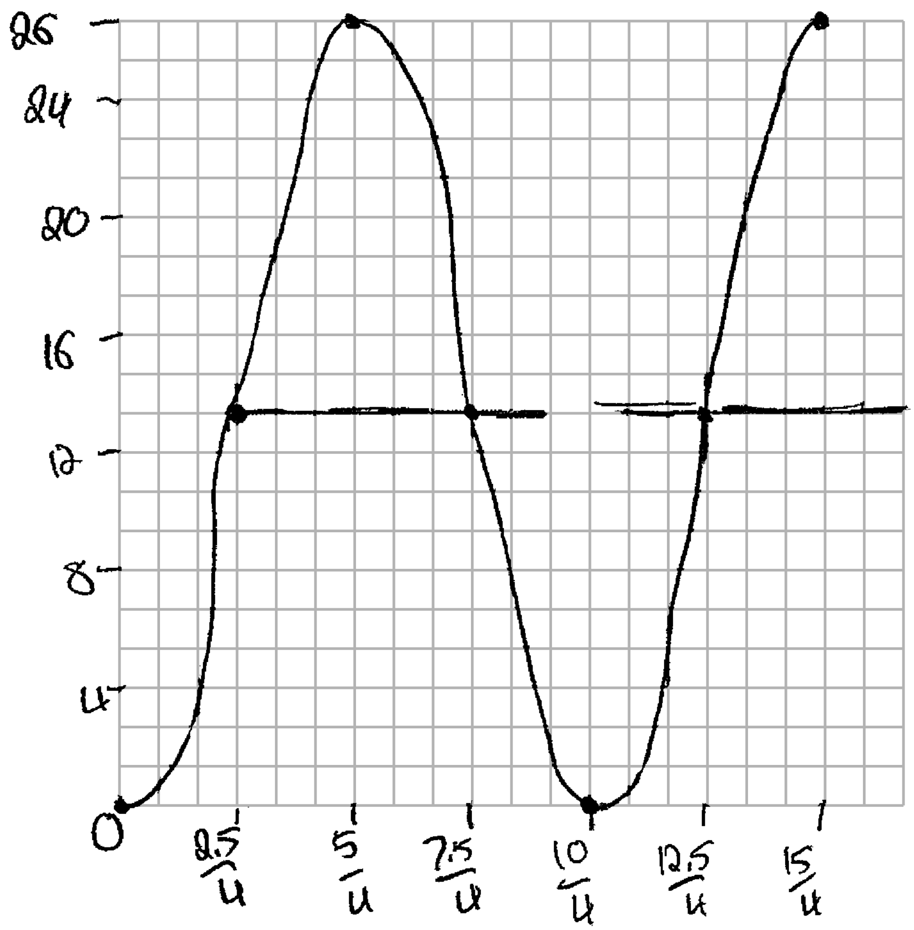
Interpret what the period represents in this context.

It takes 2.5 secons for the nail to go from highpoint back to highpoint.

Question 37 is continued on the next page.

Score 3: The student made a labeling error on the graph and did not answer the last part.

On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



$a = -13$
$b = .8\pi$
mid $= 13$
period $= 2.5$
interval $= \frac{2.5}{4}$

max $= 26$
mid $= 0$

Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

37 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire.

Determine the period of $f(t)$.

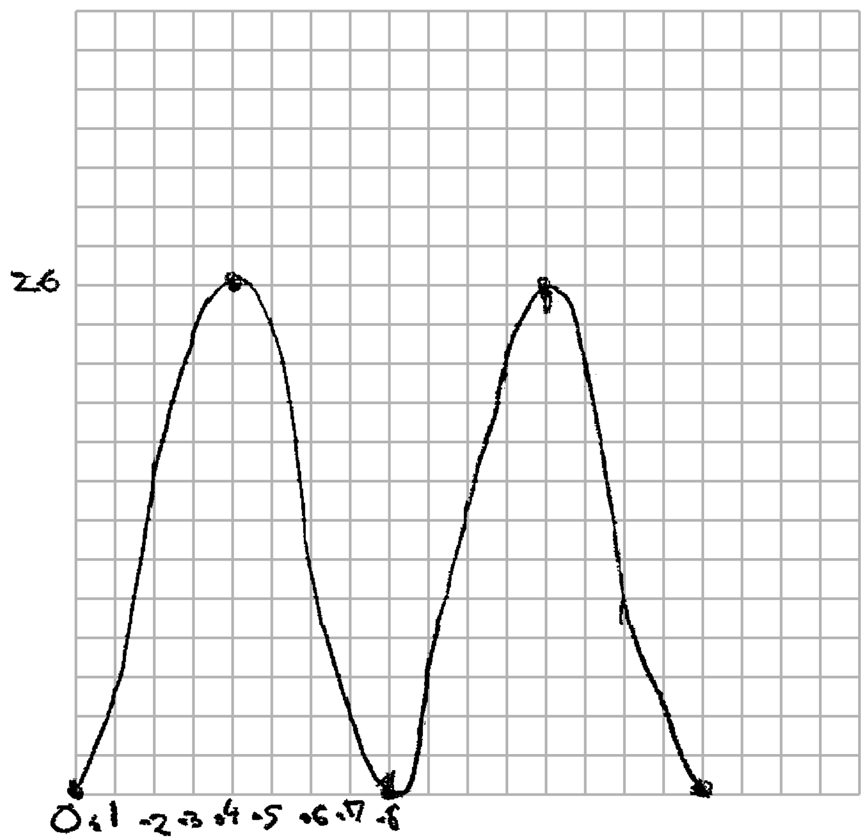
The period is 0.8 second, this represents how many seconds it takes for the nail to reach the original height it came stuck at.

Interpret what the period represents in this context.

Question 37 is continued on the next page.

Score 3: The student gave a correct interpretation based on an incorrect period and received full credit for the graph.

On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

Question 37

37 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire.

Determine the period of $f(t)$.

$.8\pi(p) = 2\pi$

$p = 2.5$

$\frac{1\cancel{2}\cancel{\pi}}{1} \times \frac{5}{\cancel{4}\cancel{\pi}_2} = \frac{5}{2}$

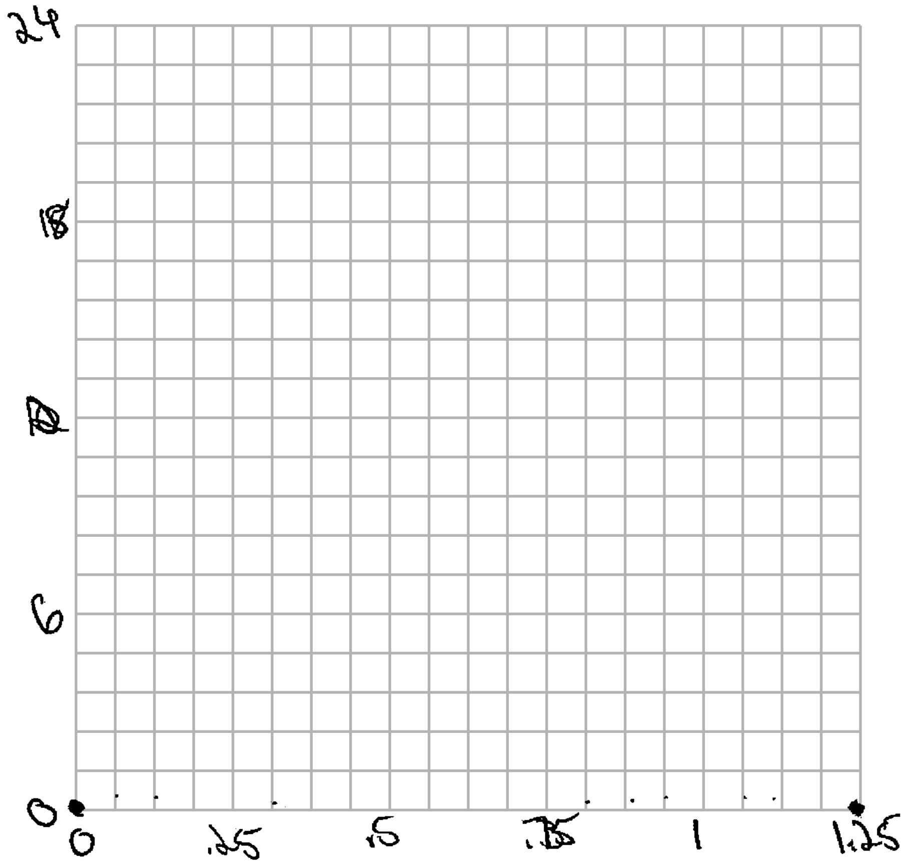
Interpret what the period represents in this context.

It takes 2.5 seconds for the nail to complete 1 full rotation

Question 37 is continued on the next page.

Score 2: The student received credit for the period and the interpretation.

On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

Question 37

37 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire.

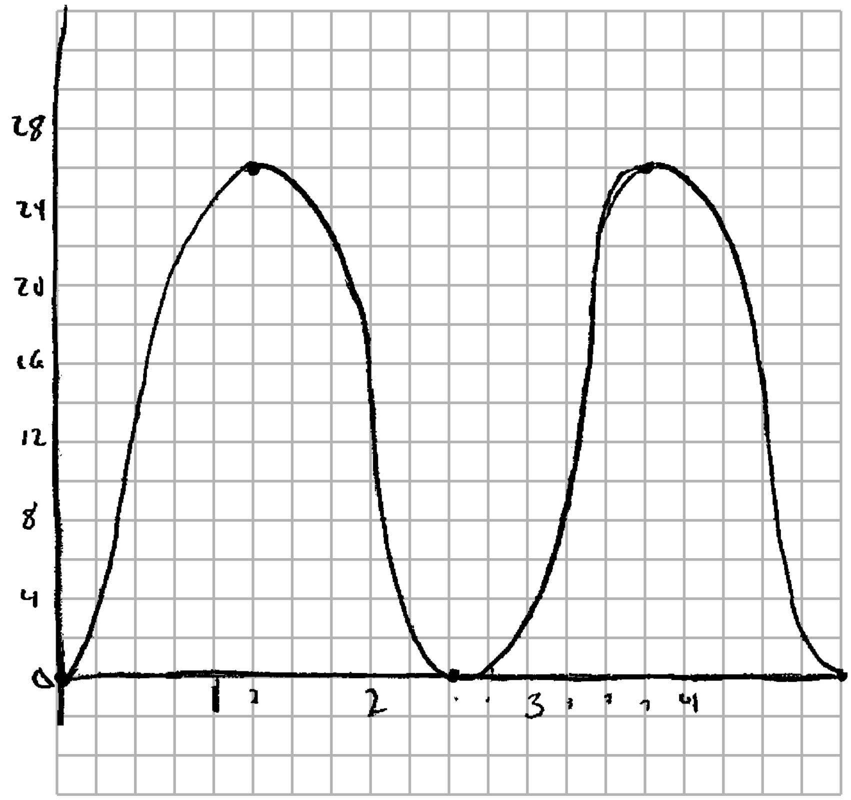
Determine the period of $f(t)$.

Interpret what the period represents in this context.

Question 37 is continued on the next page.

Score 2: The student drew a correct graph.

On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

No, the nail would not be short enough to go in the tire it would just tip over

37 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire.

Determine the period of $f(t)$.

Period $= \frac{2\pi}{\text{frequency}}$ Period $= \frac{2\cancel{\pi}}{.8\cancel{\pi}}$

$= 2.5$

Interpret what the period represents in this context.

Question 37 is continued on the next page.

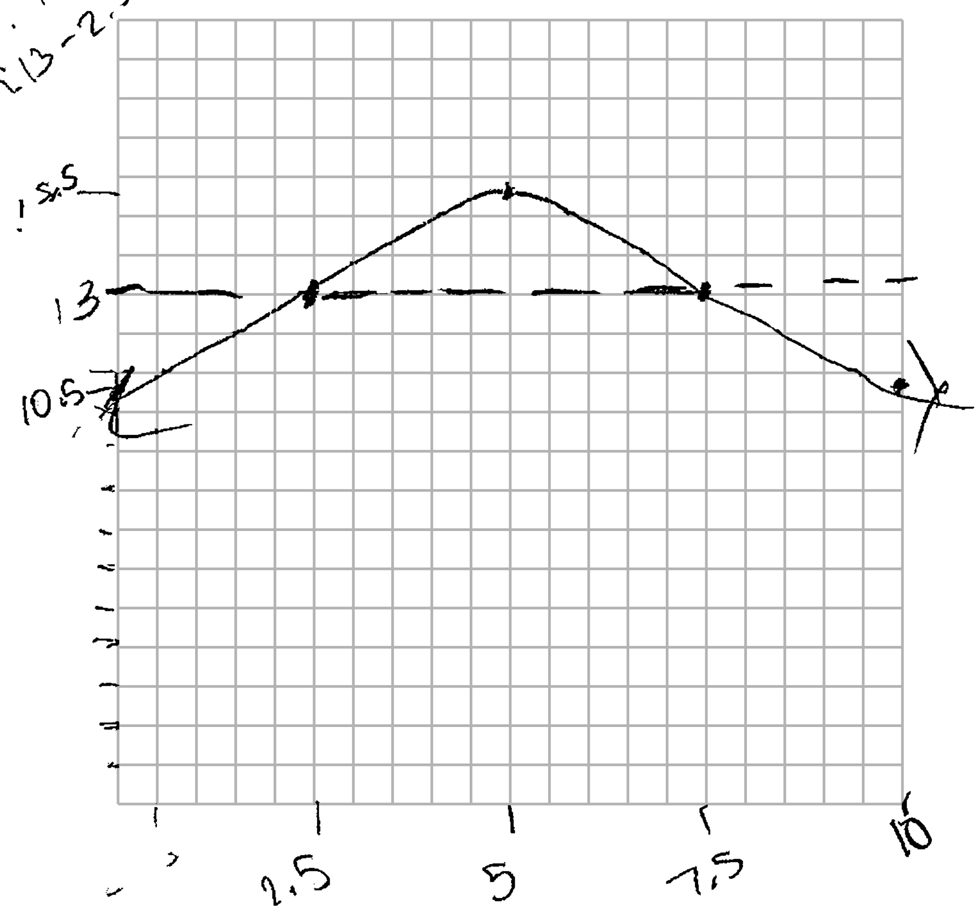
Score 1: The student received credit for correctly finding the period.

Question 37 continued.

On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.

Max: $13 + 2.5 = 15.5$

Min: $13 - 2.5 = 10.5$



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

NO

Question 37

37 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire.

Determine the period of $f(t)$.

Interpret what the period represents in this context.

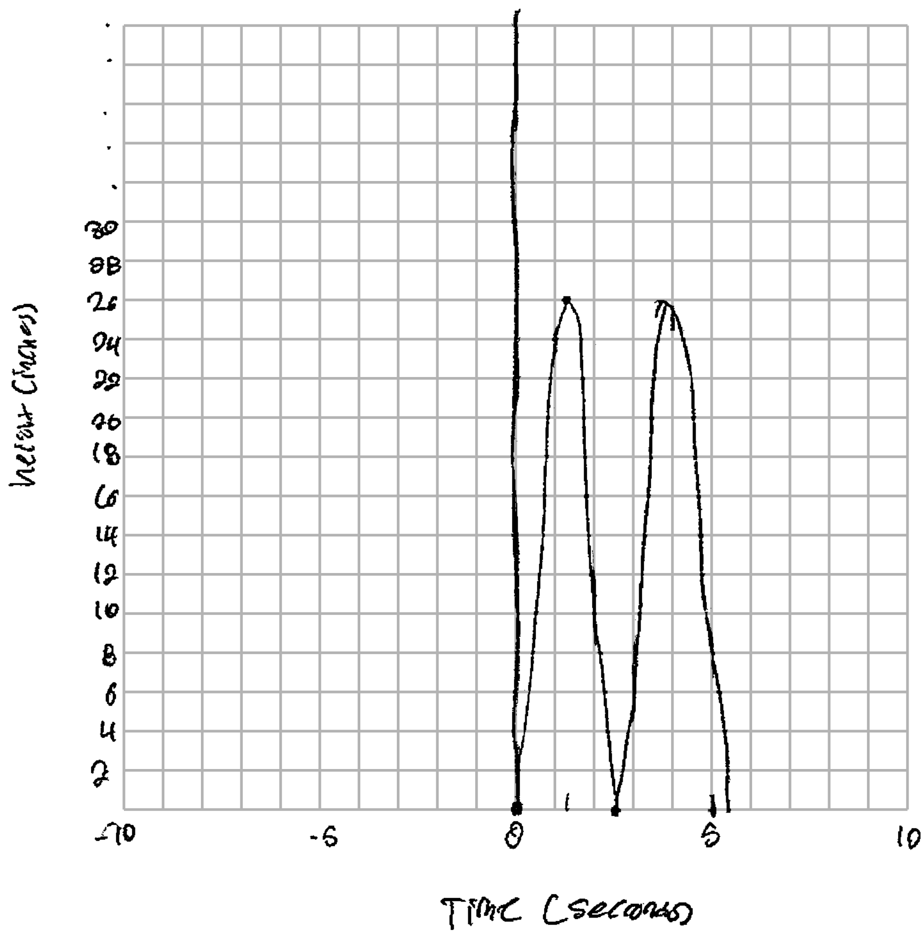
f(t) represens the cycle of the wheel
ie how high the nail is from the grand.

Question 37 is continued on the next page.

Score 1: The student received one credit for the graph.

Question 37 continued.

On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

37 Griffin is riding his bike down the street in Churchville, N.Y. at a constant speed, when a nail gets caught in one of his tires. The height of the nail above the ground, in inches, can be represented by the trigonometric function $f(t) = -13\cos(0.8\pi t) + 13$, where t represents the time (in seconds) since the nail first became caught in the tire.

Determine the period of $f(t)$.

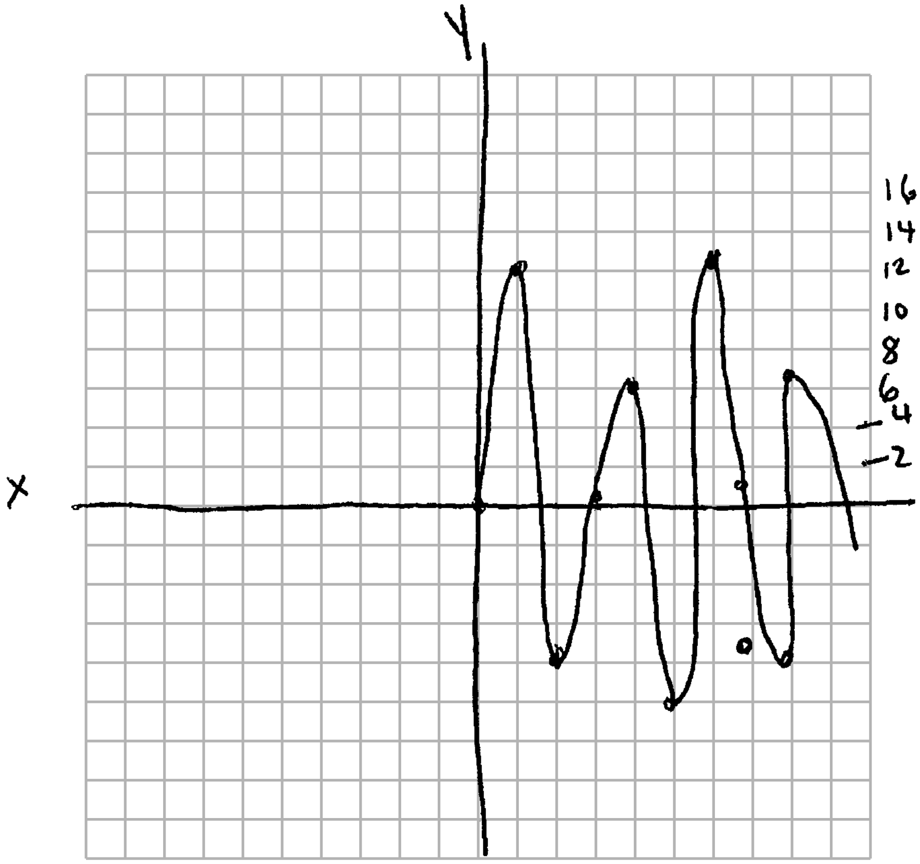
Interpret what the period represents in this context.

f(t) represents one cycle of the wheel.
and how high the nail is from the ground.

Question 37 is continued on the next page.

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

On the grid below, graph *at least one* cycle of $f(t)$ that includes the y-intercept of the function.



Does the height of the nail ever reach 30 inches above the ground? Justify your answer.

No, the maximum height is 23.5 inches.