The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II (Common Core)

Friday, June 16, 2017 — 1:15 to 4:15 p.m.

MODEL RESPONSE SET

Table of Contents

25 Given $r(x) = x^3 - 4x^2 + 4x - 6$, find the value of $r(2)$.

$r(x) = x^3 - 4x^2 + 4x - 6$
$r(2) = (2)^3 - 4(2)^2 + 4(2) - 6$
$r(2) = 8 - 4(4) + 8 - 6$
$r(2) = -6$

What does your answer tell you about $x - 2$ as a factor of $r(x)$? Explain.

x-2 would not be a factor of r(x) because when doing substitution in this problem x=2 because

$x - 2 = 0$
$+2 \quad +2$
$x = 2$

and when 2 was plugged into the equation for x that was not zero.

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

Question 25

25 Given $r(x) = x^3 - 4x^2 + 4x - 6$, find the value of $r(2)$.

$$\begin{array}{r|rrrr} 2 & 1 & -4 & 4 & -6 \\ & & 2 & -4 & 0 \\ \hline & 1 & -2 & 0 & -6 \end{array}$$

$r(2) = -6$

What does your answer tell you about $x - 2$ as a factor of $r(x)$? Explain.

$(x-2)$ is not a factor of $r(x)$ because the remainder was -6 and not 0.

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

25 Given $r(x) = x^3 - 4x^2 + 4x - 6$, find the value of $r(2)$.

$r(2) = x^3 - 4x^2 + 4x - 6$
$r(2) = (2)^3 \div 4(2)^2 + 4(2) - 6$
$r(2) = 8 - 16 + 8 - 6$
$\boxed{r(2) = -6}$

What does your answer tell you about $x - 2$ as a factor of $r(x)$? Explain.

$$\begin{array}{r} x^2 - 2x + 0 \\ x-2 \overline{\big) x^3 - 4x^2 + 4x - 6} \\ -(x^3 - 2x^2) \\ -2x^2 + 4x - 6 \\ -(-2x^2 + 4x) \\ 0x - 6 \\ -(0x + 0) \\ -6 \end{array}$$

x-2 is not a facter of $x^3 - 4x^2 + 4x - 6$

Score 1: The student gave an incomplete explanation.

Question 25

25 Given $r(x) = x^3 - 4x^2 + 4x - 6$, find the value of $r(2)$.

$$r(2) = 2^3 - 4(2)^2 + 4(2) - 6$$
$$= 6 - 8 + 8 - 6$$
$$= 0$$

What does your answer tell you about $x - 2$ as a factor of $r(x)$? Explain.

x-2 is a factor of r(x) since the remainder would be zero.

Score 1: The student stated a correct explanation based on an incorrect value.

Question 25

25 Given $r(x) = x^3 - 4x^2 + 4x - 6$, find the value of $r(2)$.

$2^3 - 4(2)^3 + 4(2) - 6$

$\boxed{r(2) = -22}$

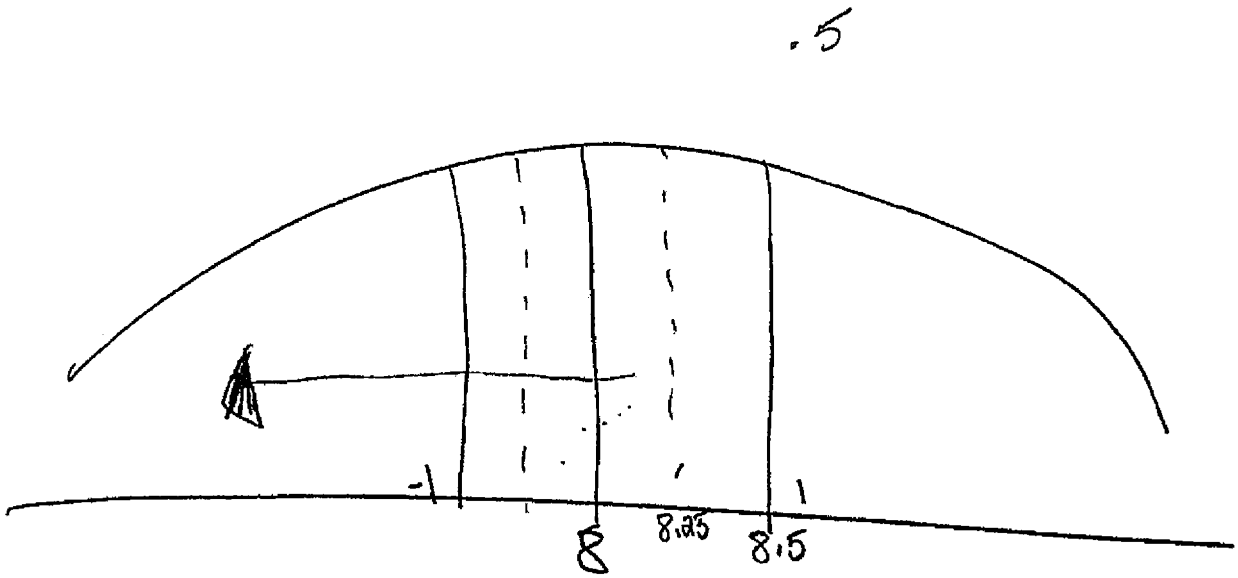
What does your answer tell you about $x - 2$ as a factor of $r(x)$? Explain.

the other factor could be positive since the answer is negative and one of the factors is negative

Score 0: The student gave a completely incorrect response.

Question 26

26 The weight of a bag of pears at the local market averages 8 pounds with a standard deviation of 0.5 pound. The weights of all the bags of pears at the market closely follow a normal distribution. Determine what percentage of bags, to the *nearest integer*, weighed *less* than 8.25 pounds.



69%

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

Question 26

26 The weight of a bag of pears at the local market averages 8 pounds with a standard deviation of 0.5 pound. The weights of all the bags of pears at the market closely follow a normal distribution. Determine what percentage of bags, to the *nearest integer*, weighed *less* than 8.25 pounds.

$19.1 + \cancel{}$

$50 + 19.1$

69%

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

Question 26

26 The weight of a bag of pears at the local market averages 8 pounds with a standard deviation of 0.5 pound. The weights of all the bags of pears at the market closely follow a normal distribution. Determine what percentage of bags, to the *nearest integer*, weighed *less* than 8.25 pounds.

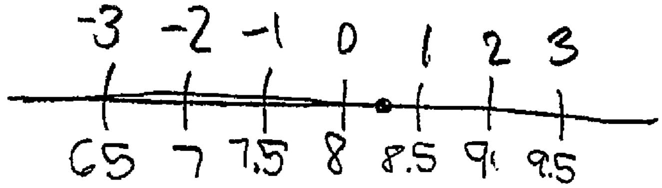
lower: 1,∞
upper: 8.25
μ: 8
σ: 0.5

= .6914624678
= 1.0

Score 1: The student made an error by not converting to a percent correctly.

Question 26

26 The weight of a bag of pears at the local market averages 8 pounds with a standard deviation of 0.5 pound. The weights of all the bags of pears at the market closely follow a normal distribution. Determine what percentage of bags, to the *nearest integer*, weighed *less* than 8.25 pounds.



$\boxed{69.1\%}$

Score 1: The student made a rounding error.

Question 26

26 The weight of a bag of pears at the local market averages 8 pounds with a standard deviation of 0.5 pound. The weights of all the bags of pears at the market closely follow a normal distribution. Determine what percentage of bags, to the *nearest integer*, weighed *less* than 8.25 pounds.

$$\frac{x - \bar{x}}{\sigma_x} \qquad \frac{8.25 - 8}{0.5} = \frac{0.25}{0.5} = 0.5$$

23%

Score 0: The student gave an incorrect response.

Question 27

27 Over the set of integers, factor the expression $4x^3 - x^2 + 16x - 4$ completely.

$4x^3-x^2+16x-4,\quad x^2(4x-1)+4(4x-1)$

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

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

Question 27

27 Over the set of integers, factor the expression $4x^3 - x^2 + 16x - 4$ completely.

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

$x^2+4=0$ | $4x-1=0$

$-4 \quad -4$ | $+1 \quad +1$

$\sqrt{x^2}=\sqrt{-4}$ | $\frac{4x}{4}=\frac{1}{4}$

$x=\pm 2i$ | $x=\frac{1}{4}$

Score 1: The student made a conceptual error by finding roots.

Question 27

27 Over the set of integers, factor the expression $4x^3 - x^2 + 16x - 4$ completely.

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

$x^2+4=0$ $\qquad$ $4x-1=0$

$-4 \quad -4$ $\qquad$ $+1 \quad +1$

$\sqrt{x^2}=\sqrt{-4}$ $\qquad$ $\frac{4x}{4}=\frac{1}{4}$

$x=\cancel{\sqrt{-4}}$

$x=\sqrt{-1}\,(\sqrt{4})$

$x=i2$ $\qquad$ $x=1/4$

Score 1: The student wrote $x^2(4x-1)+4(4x-1)$, but showed no further correct work.

Question 27

27 Over the set of integers, factor the expression $4x^3 - x^2 + 16x - 4$ completely.

$4x^3 - x^2 + 16x - 4$

$x^2(4x - 1) \quad 4(4x - 1)$

$(4x-1)(x^2+4) \rightarrow 4x^3 + 16x - x^2 - 4$

$(4x-1)(x+2)(x+2)$

Score 1: The student made one factoring error.

27 Over the set of integers, factor the expression $4x^3 - x^2 + 16x - 4$ completely.

$(4x^3 - x^2)(16x - 4)$

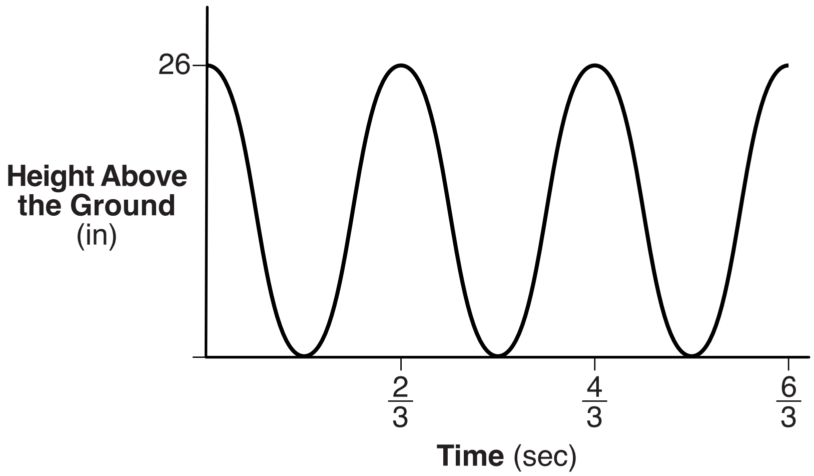
$-x^2$

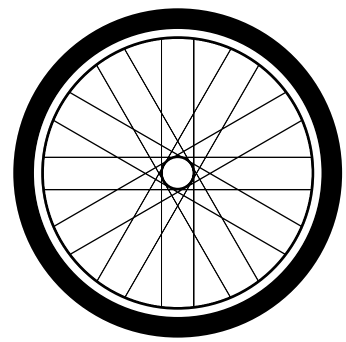
$x^2(-4x - 1) \; -4(-4x - 1)$

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

Score 0: The student made multiple factoring errors.

28 The graph below represents the height above the ground, h, in inches, of a point on a triathlete's bike wheel during a training ride in terms of time, t, in seconds.





Identify the period of the graph and describe what the period represents in this context.

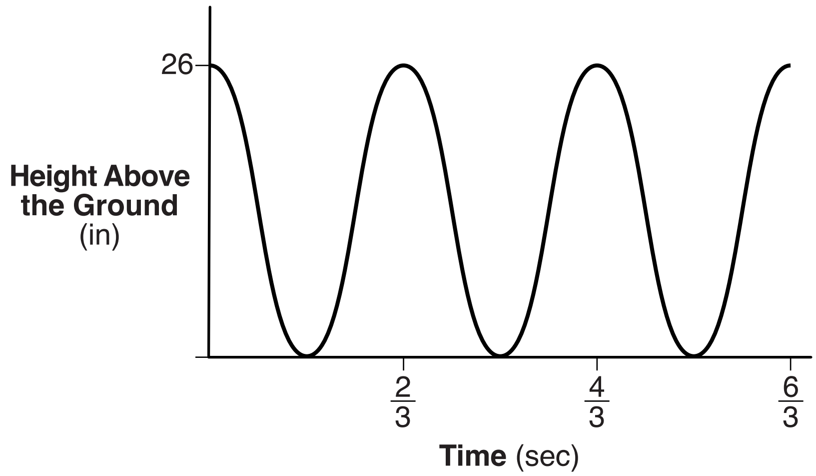
Period = $\frac{2}{3}$

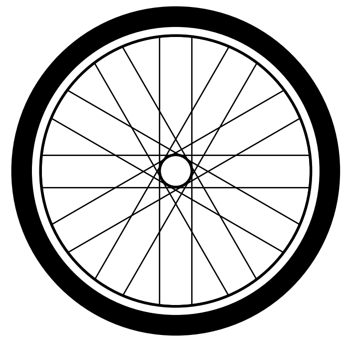
This means it take $\frac{2}{3}$ seconds for the top of the wheel to make a full rotation

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

Question 28

28 The graph below represents the height above the ground, h, in inches, of a point on a triathlete's bike wheel during a training ride in terms of time, t, in seconds.





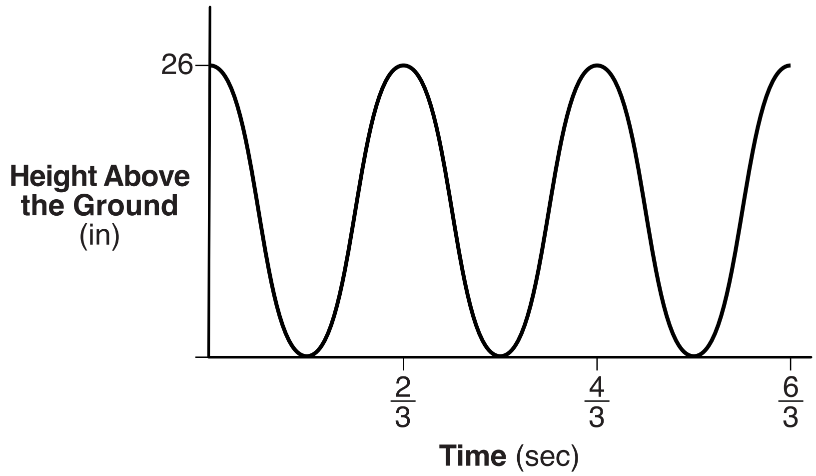
Identify the period of the graph and describe what the period represents in this context.

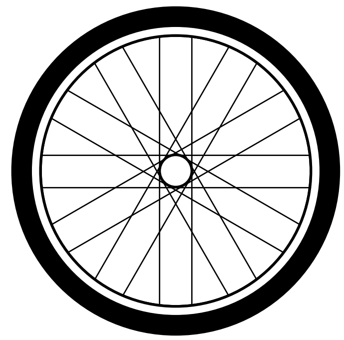
Period is $\frac{2}{3}$, It is the amount of time for the graph to reach the starting height

Score 1: The student did not describe the period in context.

Question 28

28 The graph below represents the height above the ground, h, in inches, of a point on a triathlete's bike wheel during a training ride in terms of time, t, in seconds.





Identify the period of the graph and describe what the period represents in this context.

$\frac{4}{3} - \frac{2}{3} = \frac{2}{3}$

$f\ 13\cos\left(\frac{2}{3}x\right) + 13$

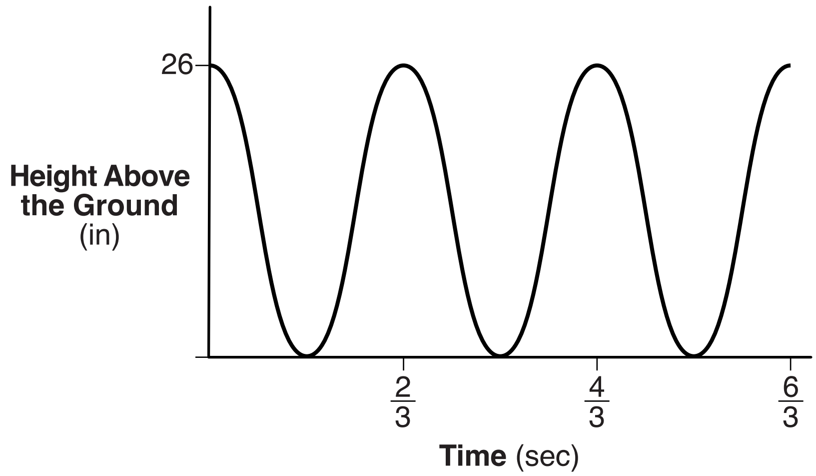
Period = 2/3

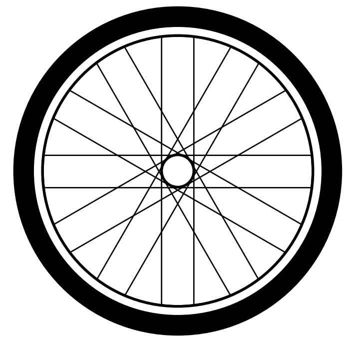
The period is 2/3 and in this context the period is representing the amount of time the rider's wheel is in the air for.

Score 1: The student gave an incomplete description.

Question 28

28 The graph below represents the height above the ground, h, in inches, of a point on a triathlete's bike wheel during a training ride in terms of time, t, in seconds.





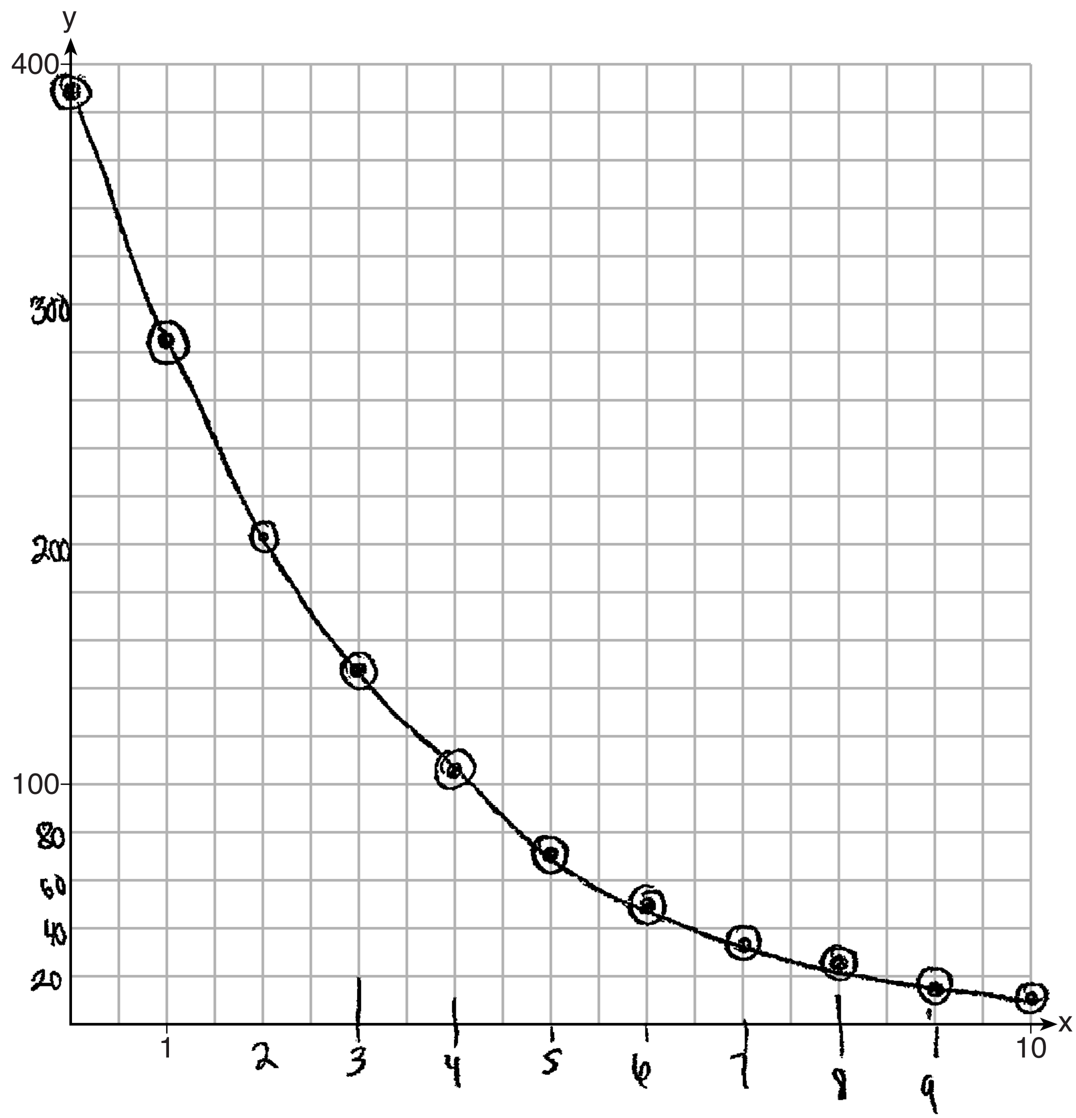
Identify the period of the graph and describe what the period represents in this context.

period represents the amount of ful turns the wreel does in a specific amant of time.

Score 0: The student gave a completely incorrect response.

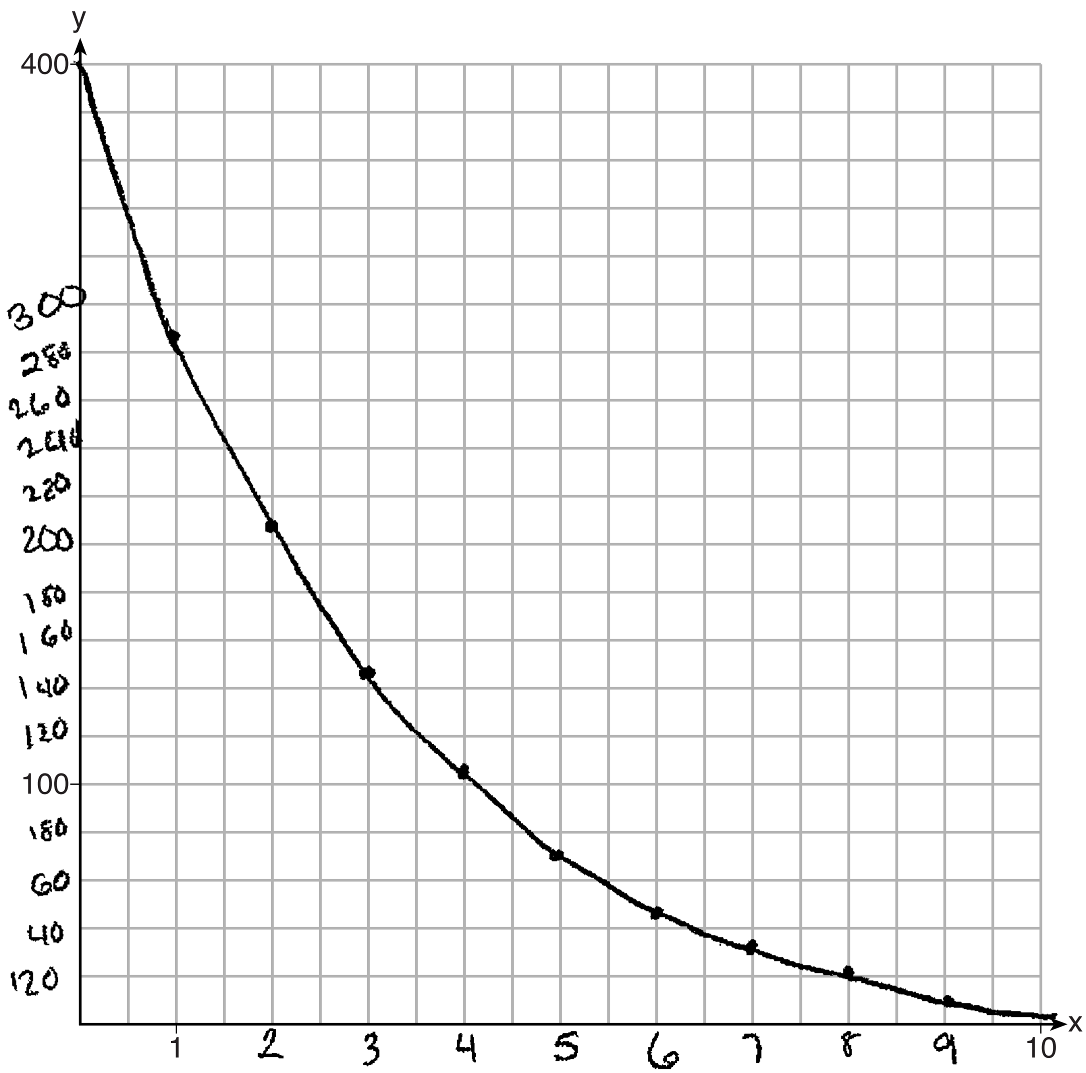
Question 29

29 Graph $y = 400(.85)^{2x} - 6$ on the set of axes below.



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

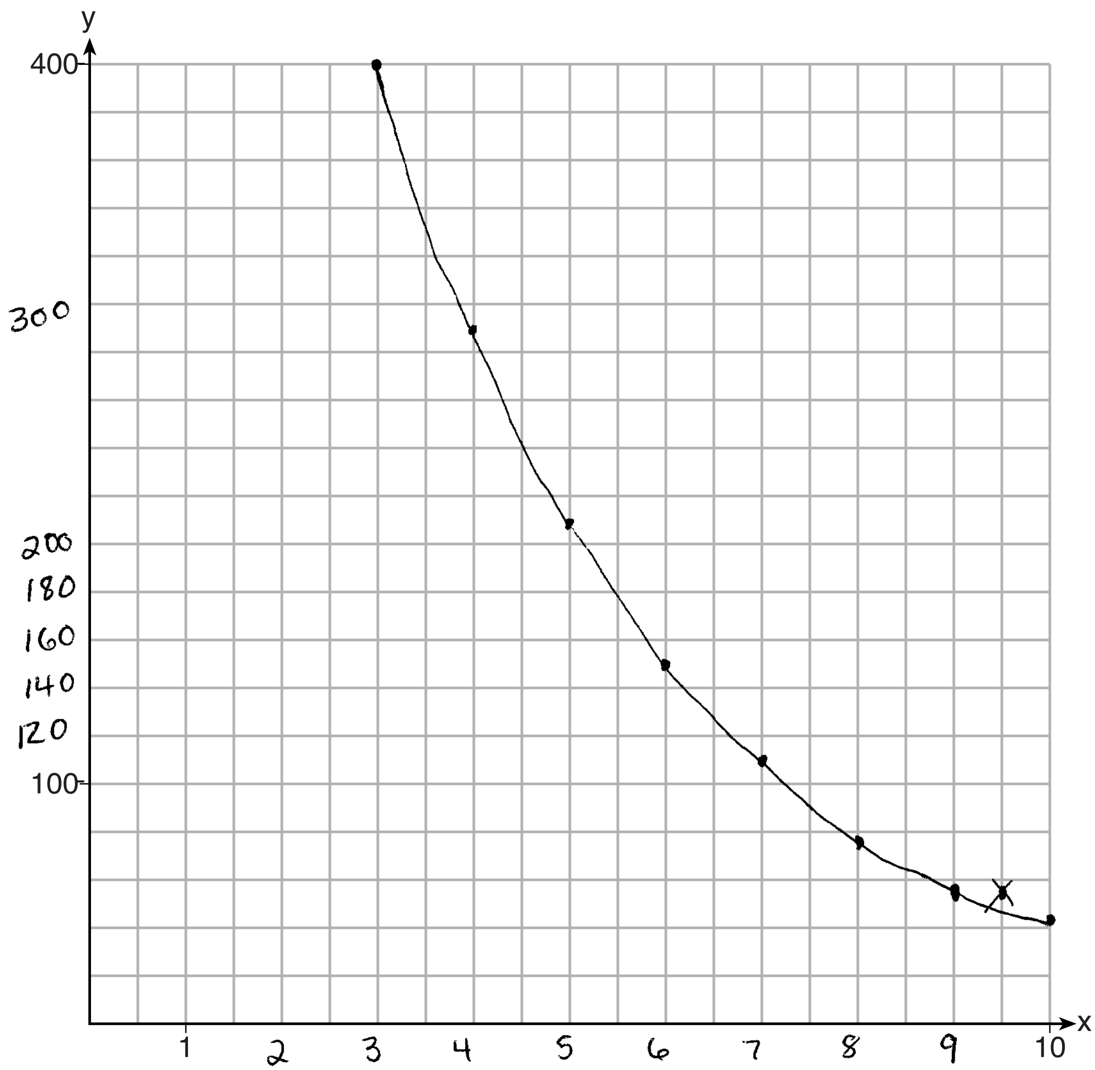
29 Graph $y = 400(.85)^{2x} - 6$ on the set of axes below.



Score 1: The student made an error graphing the y-intercept.

Question 29

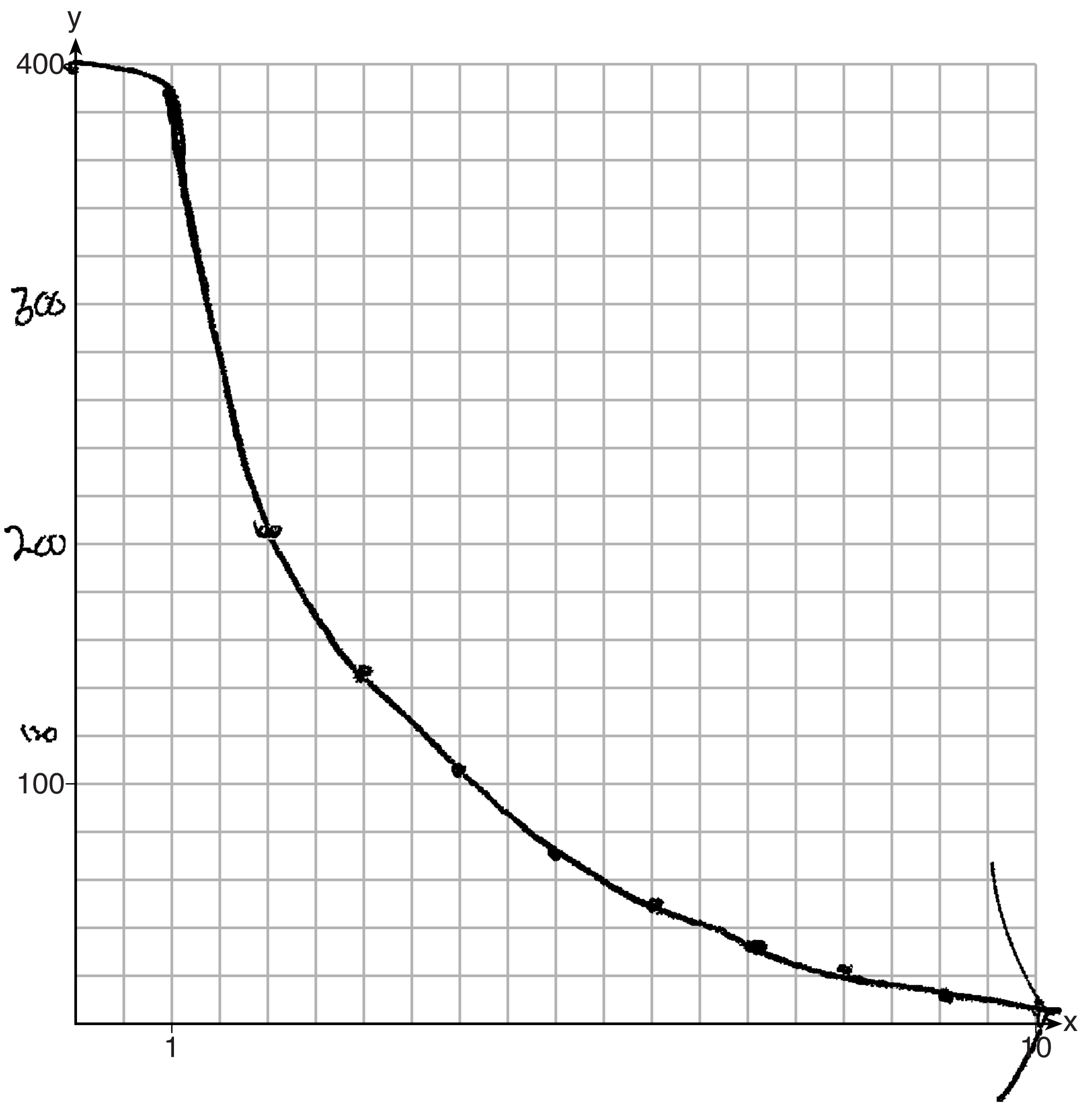
29 Graph $y = 400(.85)^{2x} - 6$ on the set of axes below.



Score 1: The student incorrectly entered the equation as $y = 400(.85)^{2x-6}$.

Question 29

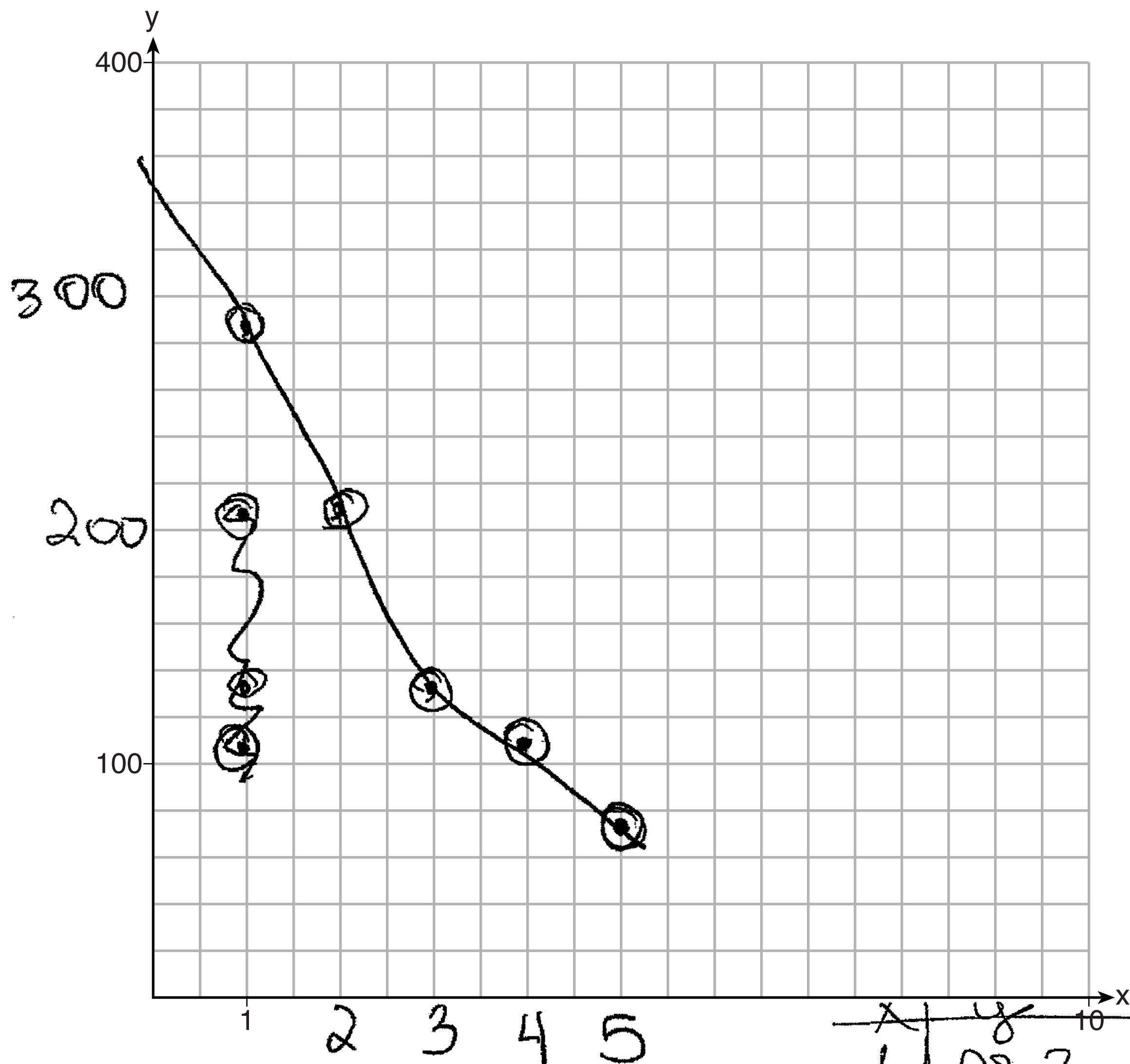
29 Graph $y = 400(.85)^{2x} - 6$ on the set of axes below.



Score 0: The student made multiple graphing errors.

Question 29

29 Graph $y = 400(.85)^{2x} - 6$ on the set of axes below.



x	y
1	283
2	202.8
3	144.80
4	103
5	72.75

Score 0: The student made multiple graphing errors.

Question 30

30 Solve algebraically for all values of x:

$$\sqrt{x-4} + x = 6$$

$(-x+6)(-x+6)$

$x^2-6x-6x+36$

$x^2-12x+36$

$\sqrt{x-4} + x = 6$

$-x \quad -x$

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

$\cancel{x-4} = x^2-12x+36$

$\cancel{-x+4} \quad -x+4$

$x^2-13x+40=0$

$(x-8)(x-5)=0$

$x-\cancel{8}=0 \quad x-\cancel{5}=0$

$\cancel{+8} \quad +8 \quad \cancel{+5} \quad +5$

$\cancel{x=8}$, $x=5$

extraneous

$\sqrt{(8)-4}+8=6$

$\sqrt{4}+8=6$

$2+8=6$

$10\neq6$

$\sqrt{(5)-4}+5=6$

$\sqrt{1}+5=6$

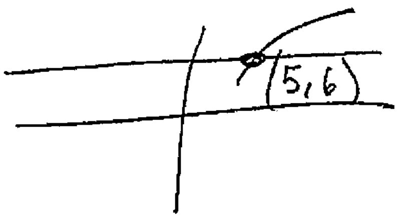
$1+5=6$

$6=6$ ✓

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

30 Solve algebraically for all values of x:

$$\overset{y_1}{\sqrt{x-4} + x} = \overset{y_2}{6}$$



x	y_1	y_2
4	4	6
5	6	6
8	10	6

$x = 5$

Score 1: The student did not use an algebraic method.

Question 30

30 Solve algebraically for all values of x:

$$\sqrt{x-4} + x = 6$$

$$\sqrt{x-4} = 6 - x$$

$$x - 4 = 36 - 12x + x^2$$

$$x^2 - 13x + 40 = 0$$

$$(x-5)(x-8) = 0$$

$$\boxed{x = 5, 8}$$

Score 1: The student did not reject 8.

Question 30

30 Solve algebraically for all values of x:

$$\sqrt{x-4} + x = 6$$

$$\sqrt{x-4}^{\,2} + x = 6^2$$

$$x - 4 + x = 36$$

$$+4 \qquad\qquad +4$$

$$x + x = 40$$

$$\frac{2x}{2} = \frac{40}{2}$$

$$\boxed{x = 20}$$

Score 0: The student made a conceptual error and did not check for extraneous roots.

Question 31

31 Write $\sqrt[3]{x} \cdot \sqrt{x}$ as a single term with a rational exponent.

$x^{1/3} \cdot x^{1/2} =$

$x^{5/6}$

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

Question 31

31 Write $\sqrt[3]{x} \bullet \sqrt{x}$ as a single term with a rational exponent.

$$x^{\frac{1}{3}} \cdot x^{\frac{1}{2}} = x^{\left(\overset{\frac{2}{6}}{\frac{1}{3}} + \overset{\frac{3}{6}}{\frac{1}{2}}\right)} = x^{5/6}$$

$$= \boxed{\sqrt[6]{x^5}}$$

Score 1: The student's response did not have a rational exponent.

Question 31

31 Write $\sqrt[3]{x} \bullet \sqrt{x}$ as a single term with a rational exponent.

$$\sqrt[3]{x} \cdot \sqrt{x}$$

$$x^{1/3} \cdot x^{1/2} \rightarrow \frac{1}{3} \cdot \frac{1}{2} = \frac{1}{6}$$

$$x^{1/6}$$

Score 1: The student multiplied the exponents.

Question 31

31 Write $\sqrt[3]{x} \bullet \sqrt{x}$ as a single term with a rational exponent.

$$\sqrt[3]{x^1} \cdot \sqrt[2]{x^1}$$

$$\sqrt[6]{x^2}$$

$$x^{2/6}$$

Score 1: The student made an error when multiplying radicands with different indices.

Question 31

31 Write $\sqrt[3]{x} \cdot \sqrt{x}$ as a single term with a rational exponent.

$\sqrt[3]{x} \cdot \sqrt{x}$

roots

$\sqrt[3]{x^2}$

$x^{\frac{2}{3}}$

Score 0: The student made an error when multiplying radicands with different indices and assumed the index of $\sqrt{x}$ to be 1.

Question 31

31 Write $\sqrt[3]{x} \cdot \sqrt{x}$ as a single term with a rational exponent.

$$\sqrt[3]{x} \cdot \sqrt{x}$$

$$\sqrt[3]{x}^{2}$$

Score 0: The student gave an incorrect response.

Question 32

32 Data collected about jogging from students with two older siblings are shown in the table below.

	Neither Sibling Jogs	One Sibling Jogs	Both Siblings Jog
Student Does Not Jog	1168	1823	1380
Student Jogs	188	416	400

Using these data, determine whether a student with two older siblings is more likely to jog if one sibling jogs or if both siblings jog. Justify your answer.

$$P(SJ|OJ) = \frac{P(SJ \cap OJ)}{P(OJ)} = \frac{\frac{416}{5375}}{\frac{2239}{5375}} = .19$$

$$P(SJ|BJ) = \frac{P(SJ \cap BJ)}{P(BJ)} = \frac{\frac{400}{5375}}{\frac{1780}{5375}} = .22$$

A student is more likely to jog if both siblings jog since after calculating the probability of a student jogging given their sibling jogs, there is a higher probability for a student to jog if both do

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

32 Data collected about jogging from students with two older siblings are shown in the table below.

	Neither Sibling Jogs	One Sibling Jogs	Both Siblings Jog
Student Does Not Jog	1168	1823	1380
Student Jogs	188	416	400
		2239	1780

Using these data, determine whether a student with two older siblings is more likely to jog if one sibling jogs or if both siblings jog. Justify your answer.

$P(S|\text{one})$ $\qquad$ $P(s|\text{two})$

$\frac{416}{2239}$ $\qquad$ $\frac{400}{1780}$

$.1858$ $\qquad$ $.2247$

more likely

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

32 Data collected about jogging from students with two older siblings are shown in the table below.

	Neither Sibling Jogs	One Sibling Jogs	Both Siblings Jog
Student Does Not Jog	1168	1823	1380
Student Jogs	188	416	400

Using these data, determine whether a student with two older siblings is more likely to jog if one sibling jogs or if both siblings jog. Justify your answer.

$P(J|O) = \frac{P(J \text{ and } O)}{P(O)}$ $P(J/B) = \frac{P(J \text{ and } B)}{P(B)}$

$= 416/2239$ $= 400/1780$

$P(J|O) = 0.187$ or 18.7% $P(J|B) = 0.225$ or 22.5%

It is more likely a student will jog if both siblings jog b/c the probability of a kid jogging whose siblings both jog is 22.5%, where a kid with one sibling who jogs - probability of jogging is 18.7%.

Score 1: The student made a computational error evaluating $P(J|O)$.

Question 32

32 Data collected about jogging from students with two older siblings are shown in the table below.

	Neither Sibling Jogs	One Sibling Jogs	Both Siblings Jog
Student Does Not Jog	1168	1823	1380
Student Jogs	188	416	400

Using these data, determine whether a student with two older siblings is more likely to jog if one sibling jogs or if both siblings jog. Justify your answer.

$\frac{416}{5375} = .077 = 7.7\%$

$\frac{400}{5375} = .074 = 7.4\%$

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

Question 33

33 Solve the following system of equations algebraically for all values of x, y, and z:

$$\begin{cases} x + y + z = 1 \\ \cancel{2x + 4y + 6z = 2} \\ -x + 3y - 5z = 11 \end{cases}$$

$$\begin{aligned} 2x + 2y + 2z &= 2 \\ -\ 2x + 4y + 6z &= 2 \\ \hline -2y - 4z &= 0 \\ y + 2z &= 0 \end{aligned}$$

$4y - 4z = 12$

$y - z = 3$

$-3z = 3$

$z = -1$

$y = 2$

$x = 0$

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

Question 33

33 Solve the following system of equations algebraically for all values of x, y, and z:

$$x + y + z = 1$$
$$2x + 4y + 6z = 2$$
$$(-x + 3y - 5z = 11)\ 2$$

$y = 3$
$z = \frac{3}{2}$
$x = \frac{-7}{2}$

$(x + y + z = 1)\ 2$
$2x + 4y + 6z = 2$

$2x + 2y + 2z = 2$
$-2x + 4y + 6z = 2$

$-2y - 4z = 0$
$+10y - 4z = 24$

$8y = \frac{24}{8}$
$y = 3$

$x + \frac{6}{2} + \frac{3}{2} = 11$

$x + \frac{9}{2} = \frac{2}{2} - \frac{9}{2}$
$- \frac{9}{2}$

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

$+ 2x + 4y + 6z = 2$
$-2x + 6y - 10z = 22$

$10y - 4z = 24$

$10(3) - 4z = 24$
$30 - 4z = 24$
$-30 \quad -30$
$\frac{-4z}{-4} = \frac{-6}{-4}$
$z = \frac{3}{2}$

$y = 3$
$z = \frac{3}{2}$
$x = \frac{-7}{2}$

Score 3: The student made a computational error when subtracting $10y$ from $-2y$.

Question 33

33 Solve the following system of equations algebraically for all values of x, y, and z:

$z=1$

$x=0$

$y=0$

$$\begin{array}{r} \cancel{x}+y+z=1 \\ -\cancel{x}+3y-5z=11 \\ \hline 4y-4z=12 \\ 2y-8z=0\,(-2) \end{array}$$

$$\begin{array}{r} x+y+z=1\,(-2) \\ -\cancel{2x}-2y-2z=-2 \\ \cancel{2x}+4y-6z=2 \\ \hline 2y-8z=0 \end{array}$$

$$\begin{array}{r} \cancel{4y}-4z=12 \\ -\cancel{4y}+16z=0 \\ \hline 12z=12 \\ \frac{12z}{12}=\frac{12}{12} \\ z=1 \end{array}$$

$$\begin{array}{r} -3x-\cancel{3y}-3z=-3 \\ -x+\cancel{3y}-5z=11 \\ \hline -4x-\cancel{8z}=8 \\ -8x+\cancel{8z}=-8 \\ \hline -12x=0 \\ x=0 \end{array}$$

$$\begin{array}{r} -4x-\cancel{4y}-4z=-4 \\ 2x+\cancel{4y}+6z=2 \\ \hline -2x+2z=-2\,(4) \end{array}$$

$0+y+1=1$

$y=0$

Score 3: The student made one transcription error by writing $2x+4y-6z=2$.

33 Solve the following system of equations algebraically for all values of x, y, and z:

$$\begin{aligned} x + y + z &= 1 \\ 2x + 4y + 6z &= 2 \\ -x + 3y - 5z &= 11 \end{aligned}$$

① $\cancel{x} + y + z = 1$
$\cancel{-x} + 3y - 5z = 11$
$4y - 4z = 12$

② $2x + 4y + 6z = 2$
$-2(x + y + z = 1)$
$\cancel{2x} + 4y + 6z = 2$
$-\cancel{2x} - 2y - 2z = -2$
$2y + 4z = 0$

③ $4y - \cancel{4z} = 12$
$2y + \cancel{4z} = 0$
$\frac{6y}{6} = \frac{12}{6}$
$\boxed{y = 2}$

④ $2x + 4y + 6z = 2$

Score 2: The student gave one solution with appropriate work.

33 Solve the following system of equations algebraically for all values of x, y, and z:

$$-1 \quad x + y + z = 1$$
$$2x + 4y + 6z = 2$$
$$2 \quad -x + 3y - 5z = 11$$

$-6x - 6y - 6z = 1$
$2x + 4y + 6z = 2$
$-4\cancel{x} - 2y = 3$
$4\cancel{x} + 8y = 12$
$\frac{6y}{6} = \frac{15}{6}$
$y = 2.5$

$-2\cancel{x} + 6y - 10z = 22$
$+ 2\cancel{x} + 4y + 6z = 2$
$10y - 4z = 24$
$\cdot(2.5)$
$2\cancel{5} - 4z = 24$
$-\cancel{25} \quad -25$
$\frac{-4z}{-4} = \frac{-1}{-4}$
$z = .25$

$5x + 5y + \cancel{8z} = 1$
$-x + 3y - \cancel{8z} = 4$
$4x + 8y = 12$
$4x + 8(2.5) = 12$

Score 2: The student made a computational error, but found appropriate values for y and z.

Question 33

33 Solve the following system of equations algebraically for all values of x, y, and z:

$$\begin{array}{r} x+y+z=1 \\ -x+3y-5z=11 \\ \hline 4y-4z=12 \end{array}$$

$$\begin{array}{r} 2x+4y+6z=2 \\ +\quad -2x+6y-10z=22 \\ \hline 10y-4z=24 \end{array}$$

$$\begin{array}{r} 4y-4z=12 \\ 10y-4z=24 \\ \hline 14y=36 \end{array}$$

Score 1: The student did enough work to create a system of equations.

Question 33

33 Solve the following system of equations algebraically for all values of x, y, and z:

$$\begin{aligned} + \quad \cancel{x}+y+z&=1 \\ -\cancel{x}+3y-5z&=11 \\ \hline 4y+6z&=12 \end{aligned}$$

$$\begin{aligned} 2x+4\cancel{y}+6\cancel{z}&=2 \\ \div \quad \cancel{4y}+\cancel{6z}&=12 \\ \hline \frac{2x}{2}&=\frac{10}{2} \\ \boxed{x=5} \end{aligned}$$

$$\begin{aligned} -3(x+y+z)&=1 \\ -3x-3\cancel{y}-3z&=-3 \\ - \quad -5+\cancel{3y}-5z&=11 \\ \hline 2+2z&=-14 \\ -2 \qquad &\quad -2 \\ \hline \frac{2z}{2}&=\frac{-16}{2} \\ \boxed{z=-8} \end{aligned}$$

$$\begin{aligned} 5+y+(-8)&=1 \\ -3y&=1 \\ +3 \quad &\quad +3 \\ \hline \boxed{y=4} \end{aligned}$$

Score 0: The student gave an incorrect response.

Question 34

34 Jim is looking to buy a vacation home for \$172,600 near his favorite southern beach. The formula to compute a mortgage payment, M, is $M = P \bullet \frac{r(1+r)^N}{(1+r)^N - 1}$ where P is the principal amount of the loan, r is the monthly interest rate, and N is the number of monthly payments. Jim's bank offers a monthly interest rate of 0.305% for a 15-year mortgage.

With no down payment, determine Jim's mortgage payment, rounded to the *nearest dollar*.

$$M = (172{,}600) \cdot \frac{0.00305(1+0.00305)^{12 \cdot 15}}{(1+0.00305)^{12 \cdot 15} - 1}$$

$$M = \frac{(172{,}600)(0.00305)(1.00305)^{180}}{(1.00305)^{180} - 1}$$

$$\boxed{\$1247}$$

$$M = 1247.493394$$

Algebraically determine and state the down payment, rounded to the *nearest dollar*, that Jim needs to make in order for his mortgage payment to be \$1100.

Let x = down payment

$$1100 = \frac{(172{,}600 - x)(0.00305)(1.00305)^{180}}{(1.00305)^{180} - 1}$$

$$(172{,}600 - x)(0.00305)(1.00305)^{180} = (1100)(1.00305^{180} - 1)$$

$$172{,}600 \cancel{-x} = \frac{(1100)(1.00305^{180} - 1)}{(0.00305)(1.00305)^{180}}$$

$$x = 172{,}600 - \frac{(1100)(1.00305^{180} - 1)}{(0.00305)(1.00305)^{180}}$$

$$\boxed{\$20{,}407}$$

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

34 Jim is looking to buy a vacation home for \$172,600 near his favorite southern beach. The formula to compute a mortgage payment, M, is $M = P \bullet \frac{r(1+r)^N}{(1+r)^N - 1}$ where P is the principal amount of the loan, r is the monthly interest rate, and N is the number of monthly payments. Jim's bank offers a monthly interest rate of 0.305% for a 15-year mortgage.

With no down payment, determine Jim's mortgage payment, rounded to the *nearest dollar*.

.00377 67 1 2 2

$M = P \cdot \frac{r(1+r)^N}{(1+r)^N - 1}$

$M = 172.600 \cdot \frac{.00305(1+.00205)^{180}}{((1+.00305)^{180} - 1)}$

$M = 1366.$

Algebraically determine and state the down payment, rounded to the *nearest dollar*, that Jim needs to make in order for his mortgage payment to be \$1100.

$M = 1{,}100$

$= .0079125174$

$1{,}100 = x \cdot (.0079125179)$

$x = 139{,}020$

$$\begin{array}{r} 172{,}600 \\ -139{,}020 \\ \hline \$33{,}580 \end{array}$$

Down payment

Score 3: The student made a transcription error before calculating the fraction.

Question 34

34 Jim is looking to buy a vacation home for \$172,600 near his favorite southern beach. The formula to compute a mortgage payment, M, is $M = P \bullet \frac{r(1+r)^N}{(1+r)^N - 1}$ where P is the principal amount of the loan, r is the monthly interest rate, and N is the number of monthly payments. Jim's bank offers a monthly interest rate of 0.305% for a 15-year mortgage.

With no down payment, determine Jim's mortgage payment, rounded to the *nearest dollar*.

$$M = 172600 \cdot \frac{.00305(1+.00305)^{180}}{(1+.00305)^{180}-1}$$

$$M = 1247.493394$$

Algebraically determine and state the down payment, rounded to the *nearest dollar*, that Jim needs to make in order for his mortgage payment to be \$1100.

$$1100 = P \cdot \frac{.00305(1+.00305)^{180}}{(1+.00305)^{180}-1}$$

$$\frac{1100}{.0072276558} = \frac{P \cdot .0072276558}{.0072276558}$$

$$P = 152193.1906$$

$$\begin{array}{r} 172600 \\ -\,152193.1906 \\ \hline 20406.80935 \end{array}$$

Score 3: The student made a rounding error.

34 Jim is looking to buy a vacation home for \$172,600 near his favorite southern beach. The formula to compute a mortgage payment, M, is $M = P \cdot \frac{r(1+r)^N}{(1+r)^N - 1}$ where P is the principal amount of the loan, r is the monthly interest rate, and N is the number of monthly payments. Jim's bank offers a monthly interest rate of 0.305% for a 15-year mortgage.

With no down payment, determine Jim's mortgage payment, rounded to the *nearest dollar*.

$$172{,}600 \cdot \frac{.00305(1+.00305)^{180}}{(1+.00305)^{180}-1} = \frac{.0052767272}{.730074504}$$

$$= \underline{1247 \text{ dollars}}$$

Algebraically determine and state the down payment, rounded to the *nearest dollar*, that Jim needs to make in order for his mortgage payment to be \$1100.

$$x \cdot \frac{.0052767272}{.730074504} = 1100$$

Score 2: The student did not calculate the down payment.

Question 34

34 Jim is looking to buy a vacation home for \$172,600 near his favorite southern beach. The formula to compute a mortgage payment, M, is $M = P \bullet \frac{r(1+r)^N}{(1+r)^N - 1}$ where P is the principal amount of the loan, r is the monthly interest rate, and N is the number of monthly payments. Jim's bank offers a monthly interest rate of 0.305% for a 15-year mortgage.

With no down payment, determine Jim's mortgage payment, rounded to the *nearest dollar*.

$$M = 172600 \cdot \frac{.305(1+.305)^{15}}{(1+.305)^{15}-1}$$

\$ 53632

Algebraically determine and state the down payment, rounded to the *nearest dollar*, that Jim needs to make in order for his mortgage payment to be \$1100.

$$1100 = x \cdot \frac{.305(1+.305)^{15}}{(1.305)^{15}-1}$$

$x = 3540.04$

$172600 - 3540.04 = 169059.96$

Score 1: The student used incorrect values to find the mortgage payment. The down payment was rounded incorrectly with these values.

Question 34

34 Jim is looking to buy a vacation home for \$172,600 near his favorite southern beach. The formula to compute a mortgage payment, M, is $M = P \bullet \frac{r(1+r)^N}{(1+r)^N - 1}$ where P is the principal amount of the loan, r is the monthly interest rate, and N is the number of monthly payments. Jim's bank offers a monthly interest rate of 0.305% for a 15-year mortgage.

With no down payment, determine Jim's mortgage payment, rounded to the *nearest dollar*.

$$M = 172{,}600 \cdot \frac{.00305(1.00305)^{15}}{(1.00305)^{15} - 1}$$

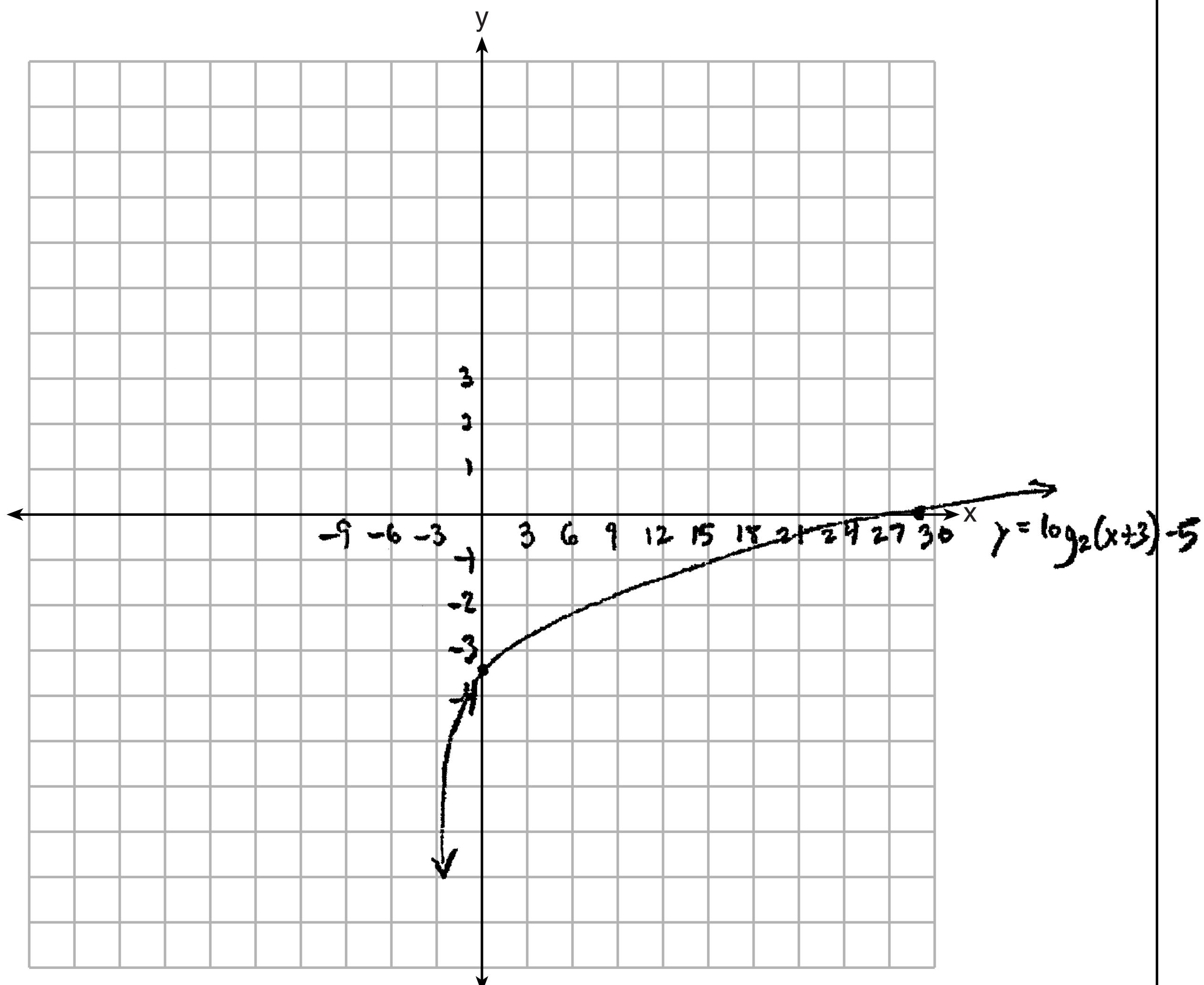
$$M = 11{,}806$$

Algebraically determine and state the down payment, rounded to the *nearest dollar*, that Jim needs to make in order for his mortgage payment to be \$1100.

Score 0: The student used 15 instead of 180 and made a computational error.

Question 35

35 Graph $y = \log_2(x + 3) - 5$ on the set of axes below. Use an appropriate scale to include *both* intercepts.



Describe the behavior of the given function as x approaches -3 and as x approaches positive infinity.

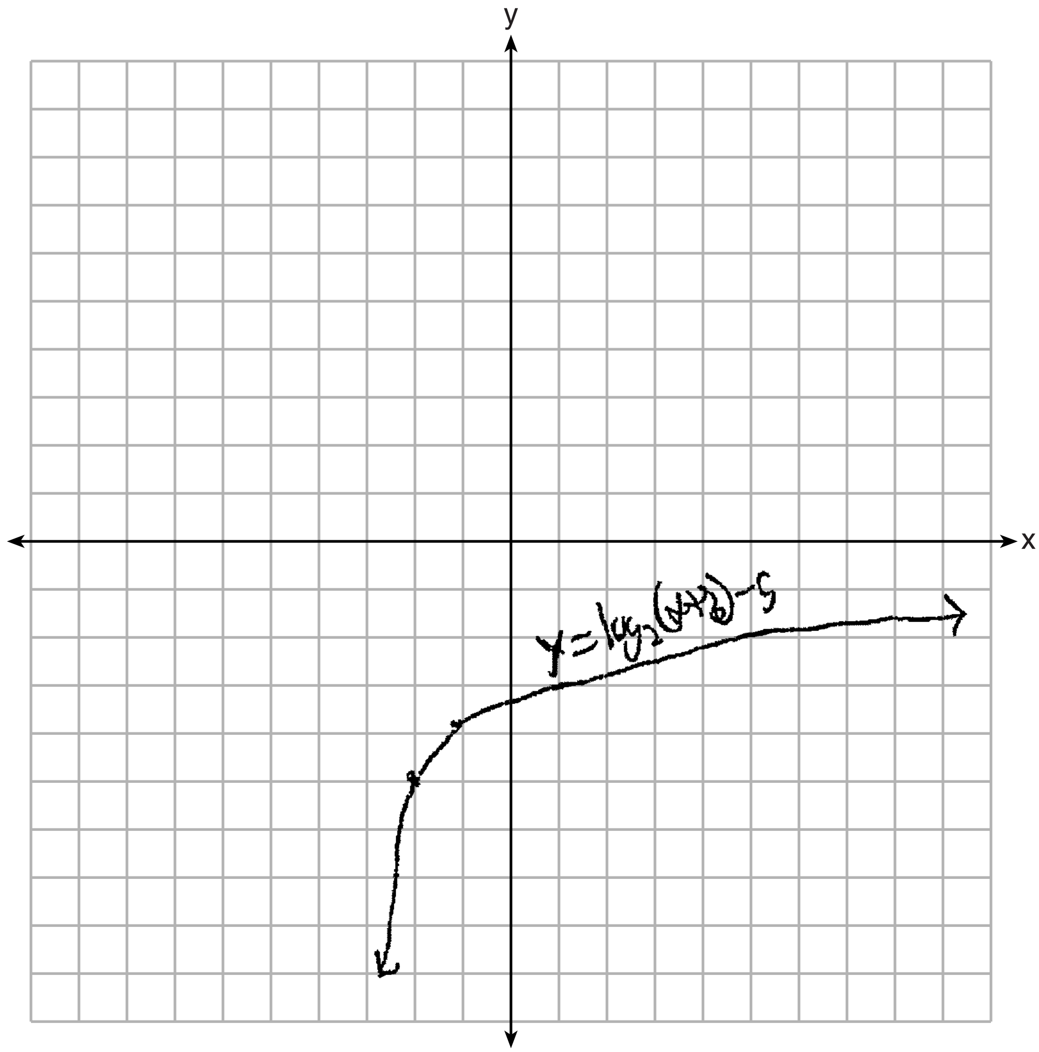
As $x \to -3$, $f(x) \to -\infty$

As $x \to \infty$, $f(x) \to \infty$

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

Question 35

35 Graph $y = \log_2(x + 3) - 5$ on the set of axes below. Use an appropriate scale to include *both* intercepts.



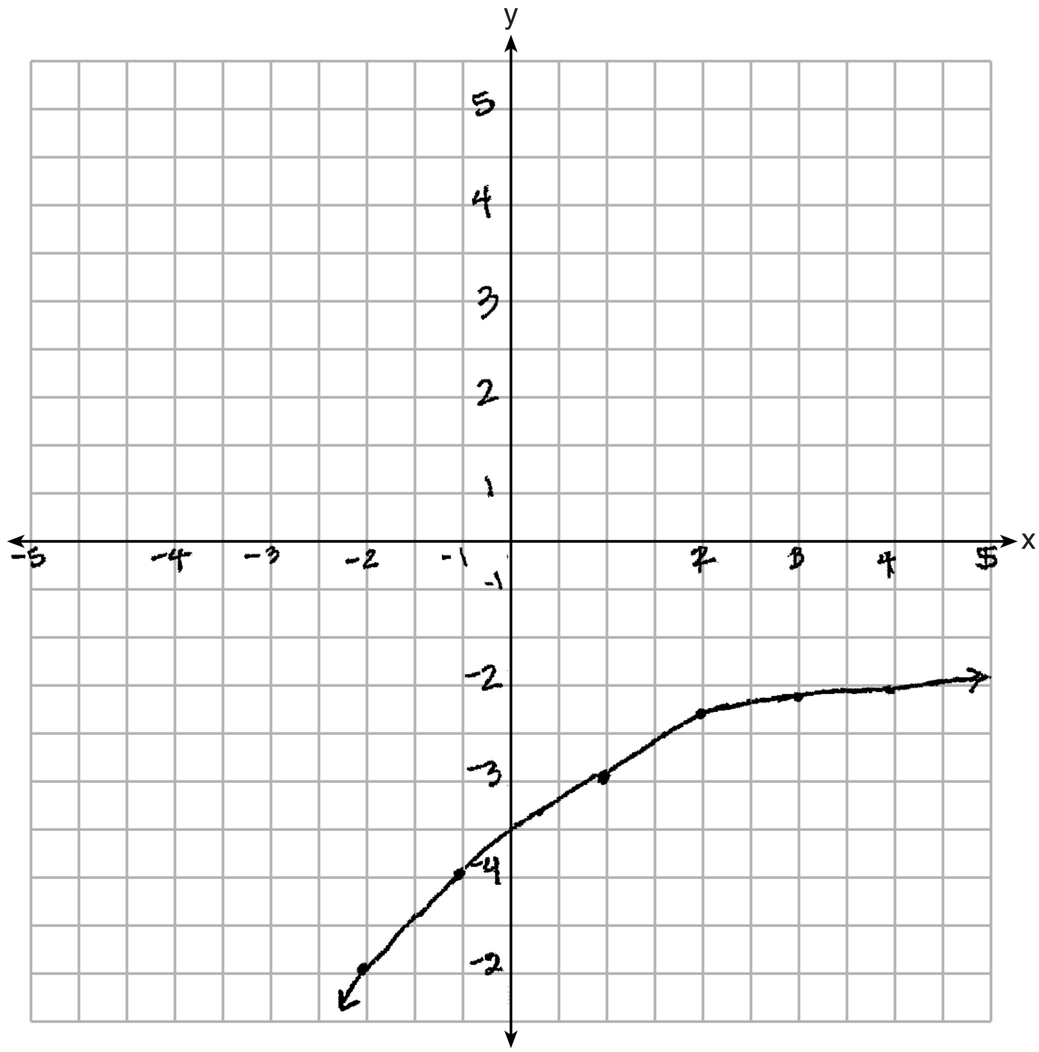
Describe the behavior of the given function as x approaches -3 and as x approaches positive infinity.

As x approaches -3, y approaches negative infinity.
As x approaches positive infinity, y approaches positive infinity

Score 3: The student did not graph both intercepts.

Question 35

35 Graph $y = \log_2(x + 3) - 5$ on the set of axes below. Use an appropriate scale to include *both* intercepts.



Describe the behavior of the given function as x approaches -3 and as x approaches positive infinity.

$x \to -3$

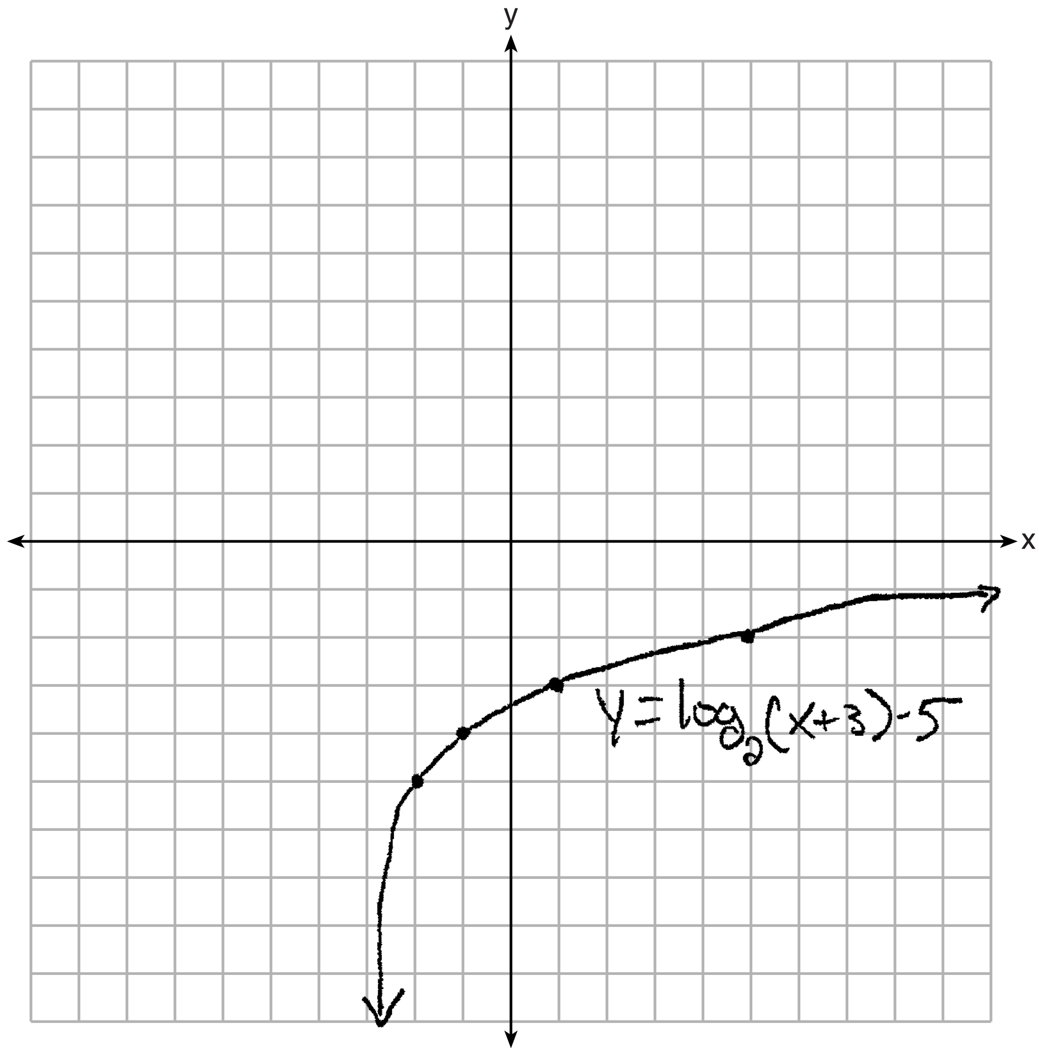
$x \to \infty$

As x approaches -3, the end behavior is to negative infinity. As x approaches positive infinity, the end behavior is to positive infinity.

Score 2: The student gave an appropriate description, but the graph was incorrect.

Question 35

35 Graph $y = \log_2(x + 3) - 5$ on the set of axes below. Use an appropriate scale to include *both* intercepts.



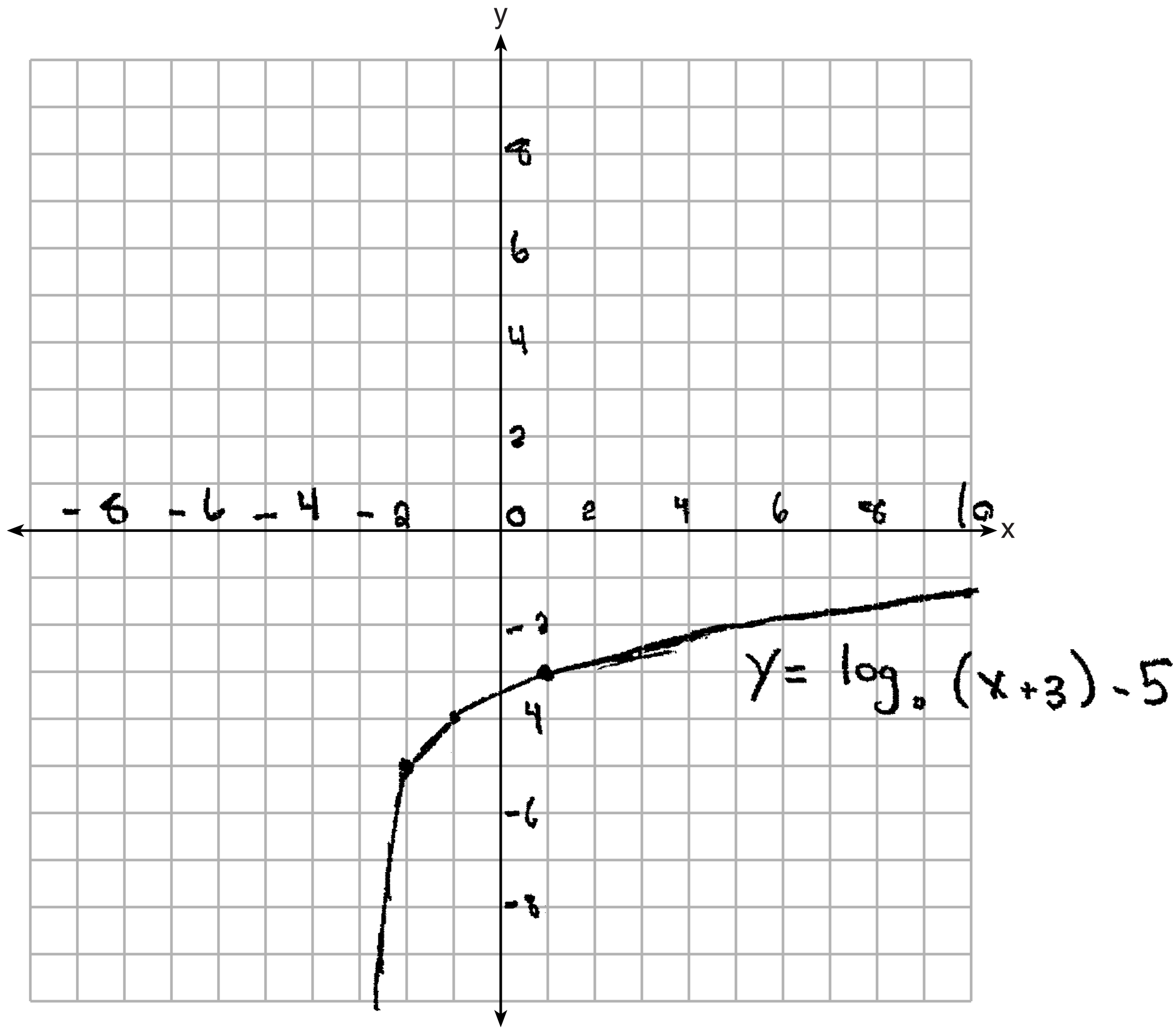
Describe the behavior of the given function as x approaches -3 and as x approaches positive infinity.

As x approaches positive infinity so does the graph. It rises above -3

Score 2: The student did not graph both intercepts and only described the right end behavior correctly.

Question 35

35 Graph $y = \log_2(x + 3) - 5$ on the set of axes below. Use an appropriate scale to include *both* intercepts.



Describe the behavior of the given function as x approaches -3 and as x approaches positive infinity.

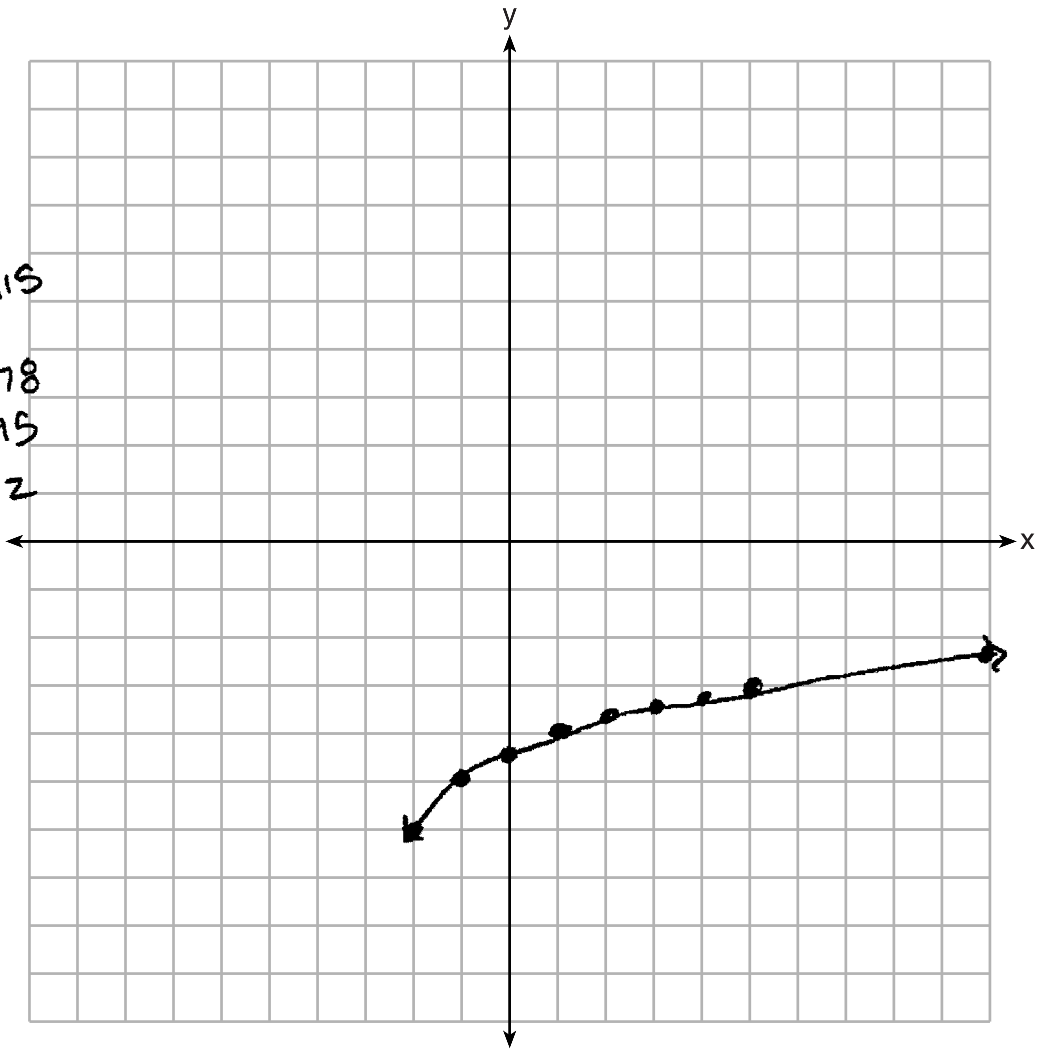
As x approached -3, it reaches an asomtope when it never reaches -3, and as x approaches positive infinity, the number interval increases get smaller and smaller,

Score 1: The student made one graphing error and described the end behavior incorrectly.

Question 35

35 Graph $y = \log_2(x + 3) - 5$ on the set of axes below. Use an appropriate scale to include *both* intercepts.

x	y
-2	-5
-1	-4
0	-3.415
1	-3
2	-2.678
3	-2.415
4	-2.192
5	-2
10	-1.3



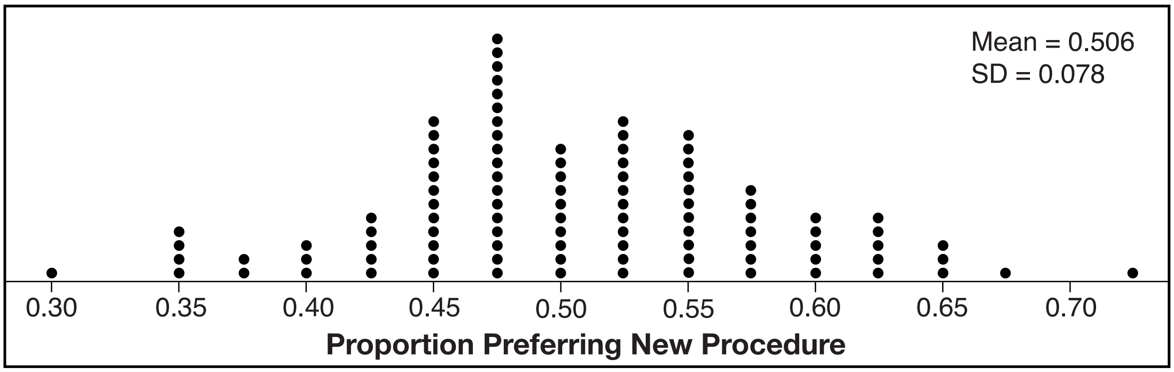
Describe the behavior of the given function as x approaches -3 and as x approaches positive infinity.

As x approaches -3, no y values will appear and as x approaches positive infinity the values start to increase gradually.

Score 0: The student gave an incorrect response.

Question 36

36 Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.



Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*.

$0.506 \pm 2 \times 0.078 =$

$= 0.506 \pm 0.156$

$0.35 \leq x \leq 0.66.$

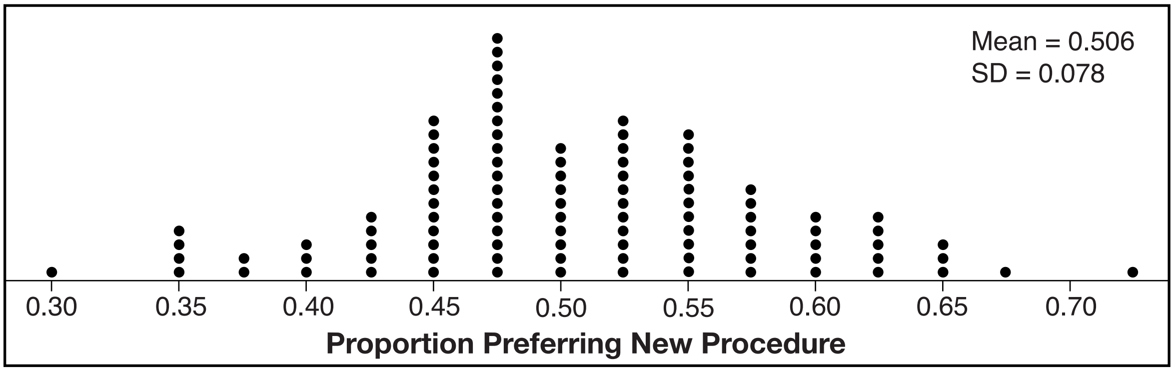
Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

Since there are 32.5% of the customers prefer the new produre and this is below. the 95% confident of the population proportion

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

Question 36

36 Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.



Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*.

Margin of error = 2(.078) = 0.156

Interval = 0.325 ± 0.156

(.17, .48)

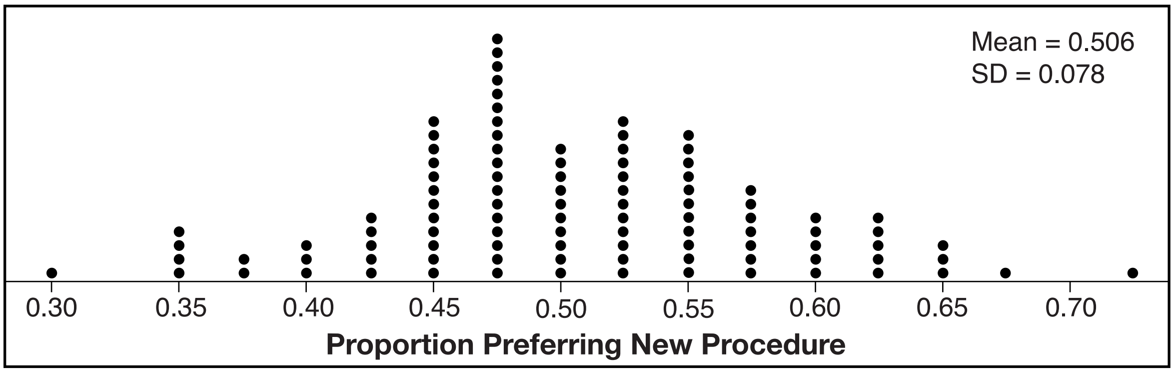
Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

Since 32.5% is inside of the interval, the dealership should implement the new check in procedure.

Score 3: The student used the sample to create an interval.

Question 36

36 Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.



Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*.

Margin of error $= 2(0.078) = \boxed{0.156}$ $\hat{p} = 0.325$

Interval: 0.325 ± 0.156

$\boxed{(0.17, 0.48)}$

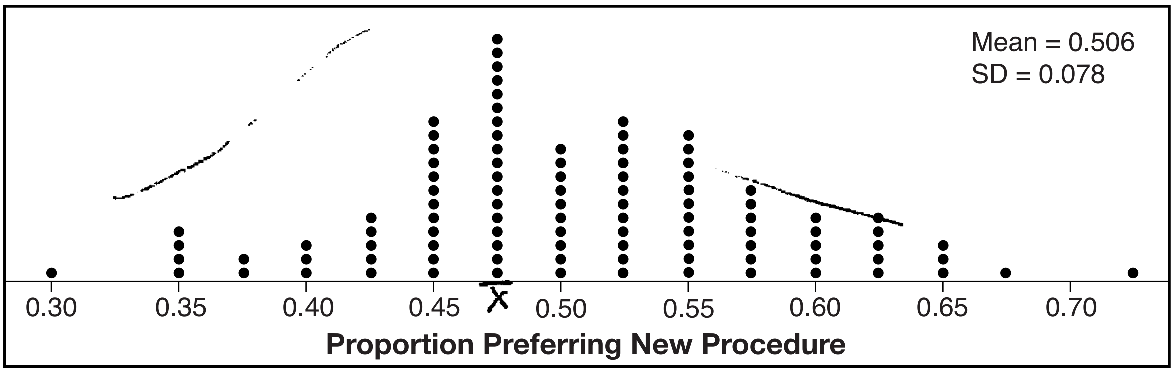
Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

Since 50% (0.5) is outside of the interval, the dealership should not implement the new check-in procedure.

Score 2: The student used the sample to create an interval and the 50% to explain the decision.

Question 36

36 Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.



Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*.

0.506 − .078 = .428 − .078 = .35 lower
0.506 + .078 = .584 + .078 = .662 upper
The interval is between .35 − .66. to be within 95% confidence

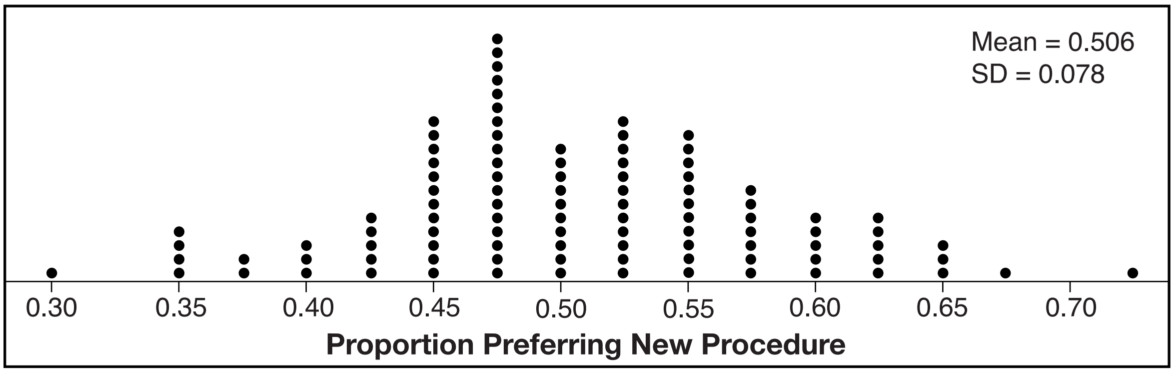
Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

The results do not show a normal mound shaped bell-curve. The data is skewed right.

Score 2: The student gave a correct interval.

Question 36

36 Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.



Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*.

There is a 95% certainty that 35% → 66% of customers prefer the procedure

$\bar{x} = .506$

$\sigma = 0.098$

$.506 \pm .156$

$2\sigma = .156$

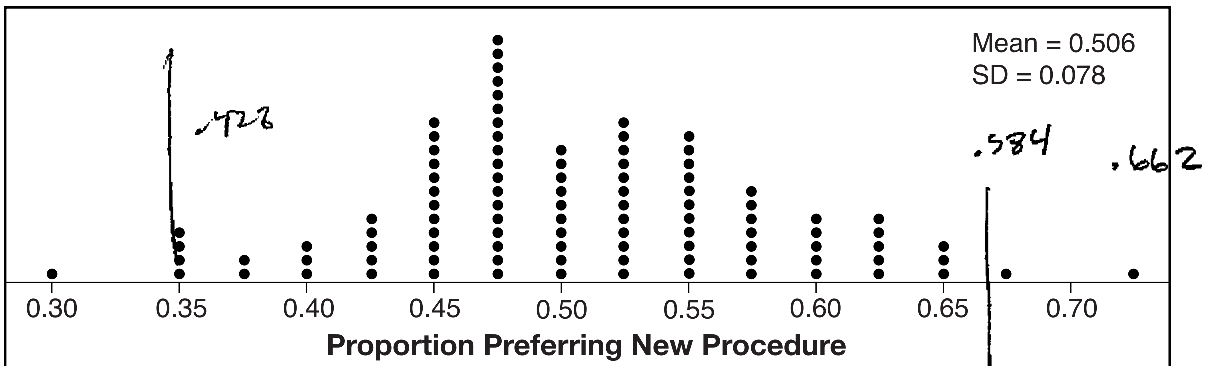
Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

While the data says that the procedure could be favorable, there's also a very good chance that the procedure would be unfavorable.

Score 2: The student found a correct interval, but did not use the statistical evidence to explain the decision.

Question 36

36 Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.



Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*.

0.35 to 0.66

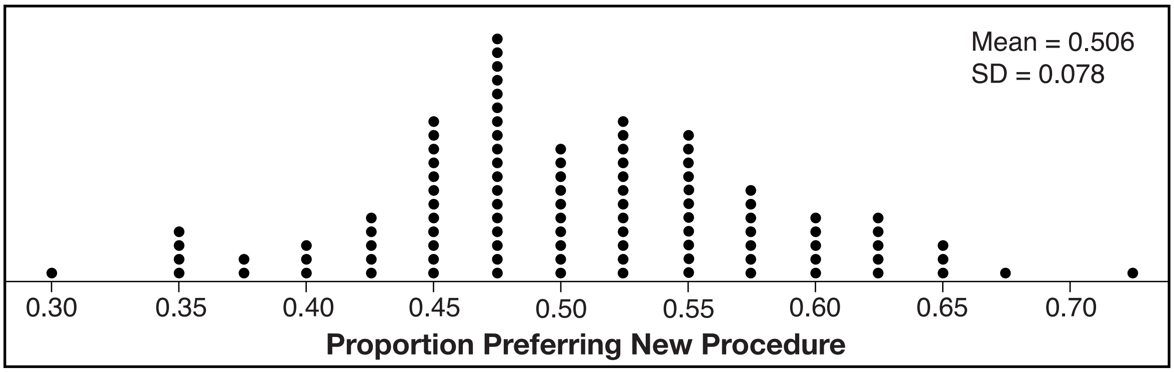
Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

Only 32.5% of customers prefer the new procedure and 50% of customers need to prefer it in order to implement it. That did not happen so the dealership does not implement it.

Score 1: The student found the correct interval, but showed no work and did not use statistical evidence to explain the decision.

Question 36

36 Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.



Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*.

Mean = .506
SD = .078

.35, .428, .506, .584, .662

.35 – .662

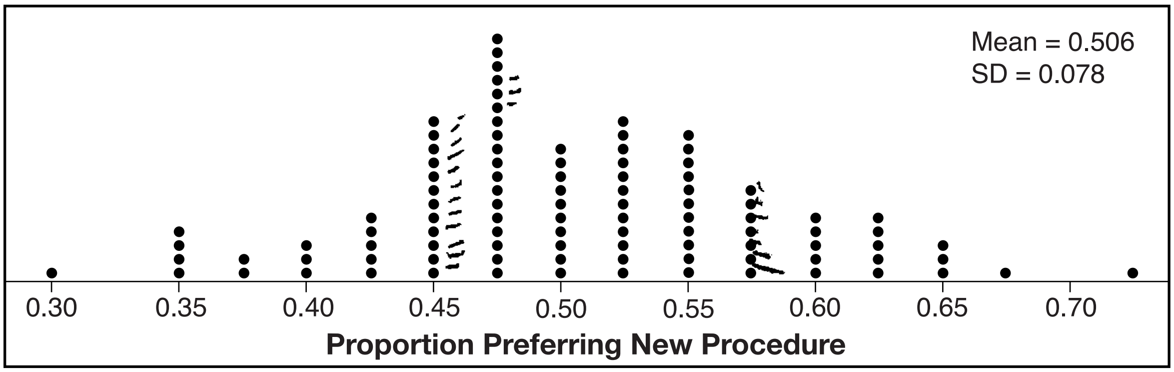
Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

The percentage of people that prefer the new check in procedure is only 32.5% which is 17.5% lower than 50%

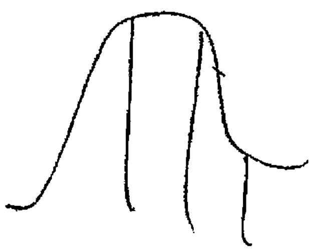
Score 1: The student gave an incorrectly rounded interval, and did not use statistical evidence to explain the decision.

Question 36

36 Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.



Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth*.



0.35 - 0.662

Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

There is a. ~~[illegible]~~ good chance that the result will be under 50%, as it goes low as 35%.

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

Question 37

37 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m.

$$100 = 140\left(\tfrac{1}{2}\right)^{\frac{5}{h}}$$

Using this equation, solve for h, to the *nearest ten thousandth*.

10.3002 hrs

$$\frac{100}{140} = \frac{\cancel{140}\left(\frac{1}{2}\right)^{\frac{5}{h}}}{\cancel{140}}$$

$$\frac{5}{7} = \left(\frac{1}{2}\right)^{\frac{5}{h}}$$

$$\frac{\log\frac{5}{7}}{\log .5} = \frac{\frac{5}{h}\cancel{\log\frac{1}{2}}}{\cancel{\log .5}}$$

$$\frac{5}{h} = \frac{.4854268}{1}$$

$$\frac{5}{.4854268} = \frac{\cancel{.4854268}h}{\cancel{.4854268}}$$

$$h = 10.3002$$

Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.

18.6 hrs

$$\frac{40}{140} = \frac{\cancel{140}\left(\frac{1}{2}\right)^{\frac{t}{10.3002}}}{\cancel{140}}$$

$$\frac{2}{7} = \frac{1}{2}^{\frac{t}{10.3002}}$$

$$\frac{\log\frac{2}{7}}{\log\left(\frac{1}{2}\right)} = \frac{\frac{t}{10.3002}\cancel{\log\frac{1}{2}}}{\cancel{\log\left(\frac{1}{2}\right)}}$$

$$\frac{1.8073549}{1} = \frac{t}{10.3002}$$

$$18.6 = t$$

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

Question 37

37 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m.

$$100 = 140\left(\tfrac{1}{2}\right)^{5/h}$$

Using this equation, solve for h, to the *nearest ten thousandth*.

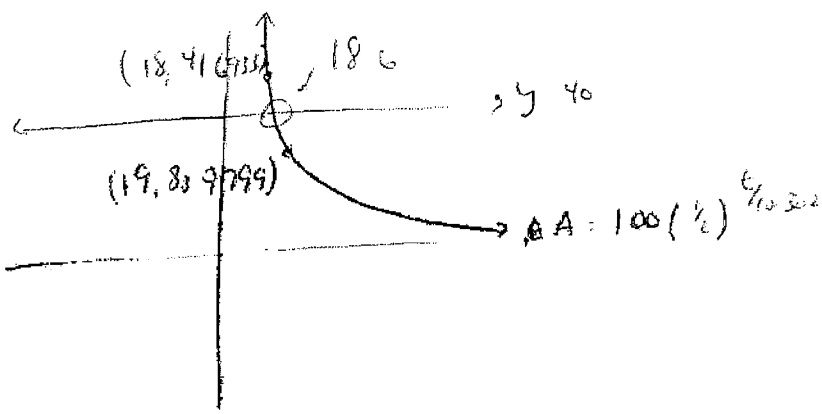
$$100 = 140\left(\tfrac{1}{2}\right)^{5/h}$$

$$\frac{5}{7} = \left(\tfrac{1}{2}\right)^{5/h}$$

$$\log \tfrac{5}{7} = \frac{5}{h}\log\tfrac{1}{2}$$

$$h = \frac{5\log \frac{1}{2}}{\log \frac{5}{7}} = 10.3002$$

Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.



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

37 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m.

$\boxed{100 = 140\left(\frac{1}{2}\right)^{\frac{5}{h}}}$ $\quad A = 140_g\left(\frac{1}{2}\right)^{\frac{t}{17.5}}$ $\quad \cancel{20 = 5h}$ $\quad \cancel{4 = 7h}$ $\quad \cancel{h = 17.5}$

Using this equation, solve for h, to the *nearest ten thousandth*.

$100 = 140\left(\frac{1}{2}\right)^{\frac{5}{h}} \rightarrow \frac{100}{140} = \frac{1}{2}^{\frac{5}{h}} \rightarrow \ln 100 - \ln 140 = \frac{5}{h}\ln\frac{1}{2}$

$\downarrow$

$-.336... = \left(\frac{5}{h}\right)\left(\frac{-.693...}{1}\right)$

$\downarrow$

$-.\frac{336...}{1} = \frac{-3.465...}{h}$

$\cancel{-.336}h = \frac{-3.465}{-.336} \rightarrow \boxed{h = 10.3002}$

Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.

$40 = 140\left(\frac{1}{2}\right)^{\frac{\cancel{8}}{10.3002}}$

$\ln\frac{40}{140} = \frac{\cancel{8}}{10.3002}\ln\frac{1}{2}$

$\downarrow$

$\cancel{3.557}h = \frac{\cancel{-3.465}}{3.557}$

$\boxed{18.1}$

 The student gave a partial solution for the time.

Question 37

37 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m.

$$100 = 140\left(\tfrac{1}{2}\right)^{\frac{5}{h}}$$

Using this equation, solve for h, to the *nearest ten thousandth*.

$$\frac{5}{7} = \left(\frac{1}{2}\right)^{\frac{5}{h}}$$

$$\log_{\frac{1}{2}} \frac{5}{7} = \frac{5}{h}$$

$h = 10.3002$ hours

Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.

$$40 = 140\left(\tfrac{1}{2}\right)^{\frac{t}{10.3002}}$$

Score 4: The student did not determine when the weight of the substance will be 40g.

Question 37

37 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m.

Using this equation, solve for h, to the *nearest ten thousandth*.

$$\frac{100}{140} = \frac{140\left(\frac{1}{2}\right)^{5/x}}{140}$$

$$\frac{100}{140} = \left(\frac{1}{2}\right)^{5/x}$$

$$\frac{\log_{1/2}\left(\frac{100}{140}\right)}{1} = \frac{5}{x}$$

$$\frac{5}{\log_{1/2}\left(\frac{100}{140}\right)} = x$$

$$x = 10.3002$$

Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.

Score 3: The student did not write the equation in terms of h, and did not determine when the substance will be 40 g.

Question 37

37 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m.

$$100 = 140\left(\frac{1}{2}\right)^{\frac{5}{h}}$$

Using this equation, solve for h, to the *nearest ten thousandth*.

$$\frac{100}{140} = \frac{140\left(\frac{1}{2}\right)^{\frac{5}{h}}}{140}$$

$$0.7143 = \left(\frac{1}{2}\right)^{5/h}$$

$$\ln(0.7143) = \frac{5}{h}\ln 0.5$$

$$\boxed{h = 10.3008}$$

Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.

$$40 = 140\left(\frac{1}{2}\right)^{\frac{5}{h}}$$

$$0.2857 = \left(\frac{1}{2}\right)^{5/h}$$

$$\ln(0.2857) = \frac{5}{h}\ln\left(\frac{1}{2}\right)$$

$$\boxed{h = 2.8}$$

Score 3: The student gave a correct equation, but rounded too early.

Question 37

37 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m.

$100 = 140\left(\frac{1}{2}\right)^{\frac{5}{h}}$

$140 \to 100 = \frac{40}{8} = 8$

$3 \to 8$

$700 = 13$

Using this equation, solve for h, to the *nearest ten thousandth*.

$100 = 140\left(\frac{1}{2}\right)^{\frac{5}{h}}$

$.7142 = \left(\frac{1}{2}\right)^{\frac{5}{h}}$

$\frac{\log .7142}{\log .5} = \frac{5}{h}\frac{\log .5}{\cancel{\log .5}}$

$\frac{.4855999961}{1} = \frac{5}{h}$

$\boxed{h = 10.297}$

Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.

$40 = 140\left(\frac{1}{2}\right)^{x}$

idk

Score 2: The student gave a correct equation, but rounded too early and incorrectly rounded h.

Question 37

37 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m.

what?

what is A? t?

$\cancel{A = 140\left(\frac{1}{2}\right)^{t}}$

$100 = 140\left(\frac{1}{2}\right)^{\frac{5}{h}}$

Using this equation, solve for h, to the *nearest ten thousandth*.

$100 = 140\left(\frac{1}{2}\right)^{\frac{5}{h}}$

$\frac{5}{7} = \left(\frac{1}{2}\right)^{\frac{5}{h}}$

$\log\frac{5}{7} = \frac{5}{h}\log\frac{1}{2}$

$.4854268 = \frac{5}{h}$

$.09708 = h$

$.0971 = h$

Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.

$40 = 140\left(\frac{1}{2}\right)^{\frac{x}{5}}$

3.26 hours

Score 2: The student gave a correct equation, but made a conceptual error in solving for h.

Question 37

37 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m.

Using this equation, solve for h, to the *nearest ten thousandth*.

$\cancel{A\,A_t}$

$100 = 140(1/2)^{5/h}$

$\frac{100}{140} \quad \frac{140}{140}$

$\frac{.714}{.5} = \frac{1/2^{5/h}}{.5} \qquad 5 \cdot 1.428 = 5/h \cdot 5$

$7.143 = h$

Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.

14.9 hours

$40 = 140(1/2)^{t/7.143}$

14.0817

$\frac{40}{140} \quad \frac{140}{140}$

$\frac{.2857}{1/2} = \frac{1/2^{t/7.143}}{1/2}$

$7.143 \cdot .5714 = t/\cancel{7.143} \; \cancel{7.143}$

Score 1: The student gave a correct equation.

37 A radioactive substance has a mass of 140 g at 3 p.m. and 100 g at 8 p.m. Write an equation in the form $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ that models this situation, where h is the constant representing the number of hours in the half-life, A_0 is the initial mass, and A is the mass t hours after 3 p.m.

$$100 = 140\left(\frac{1}{2}\right)\frac{5}{h}$$

Using this equation, solve for h, to the *nearest ten thousandth*.

$$100 = 140\left(\frac{1}{2}\right)\frac{5}{h}$$

$$\frac{100}{70} = \frac{\cancel{70}\frac{5}{h}}{\cancel{70}}$$

$$\cdot 5\ 1.429 = \frac{5}{h}\cdot \cancel{5}$$

$$h = 7.143$$

Determine when the mass of the radioactive substance will be 40 g. Round your answer to the *nearest tenth of an hour*.

$$40 = 140\left(\frac{1}{2}\right)\frac{5}{h}$$

$$\frac{40}{70} = \frac{\cancel{70}\frac{5}{h}}{\cancel{70}}$$

$$5 \cdot\ 0.571 = \frac{5}{h}\cdot \cancel{5}$$

$$h = 2.857$$

3 hours

Score 0: The student gave a completely incorrect response.