The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

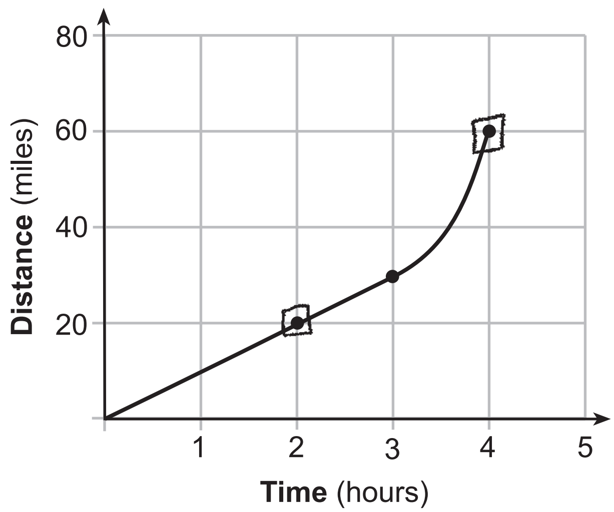
ALGEBRA II

Tuesday, August 16, 2022 — 12:30 to 3:30 p.m., only

MODEL RESPONSE SET

Table of Contents

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.



Distance₁ = 20m
time = Hour 2

Distance

$x_1 \quad y_1$
$(2, 20)$
$x_2 \quad y_2$
$(4, 60)$

$\frac{\Delta Y}{\Delta x}$

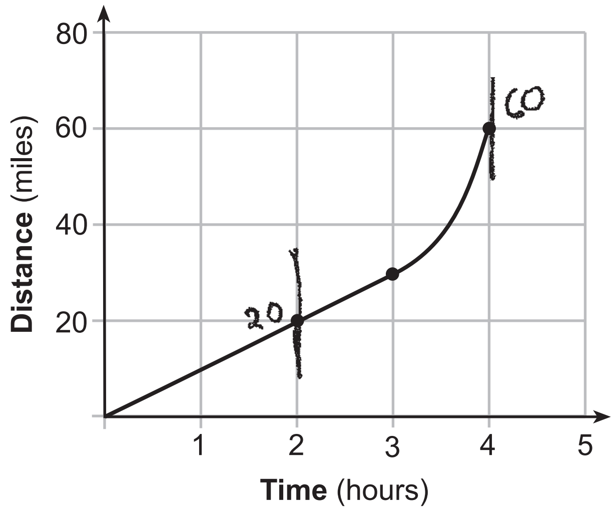
$\frac{60-20}{4-2} = \frac{40}{2} = 20$

$\boxed{\text{20 mph = average rate of change}}$

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

Question 25

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.

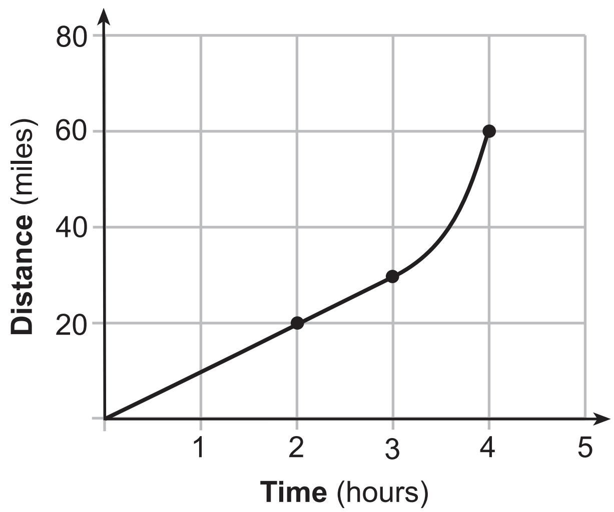


$$\frac{40\text{m}}{2\text{hr}} = \boxed{20\text{mph}}$$

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

Question 25

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.

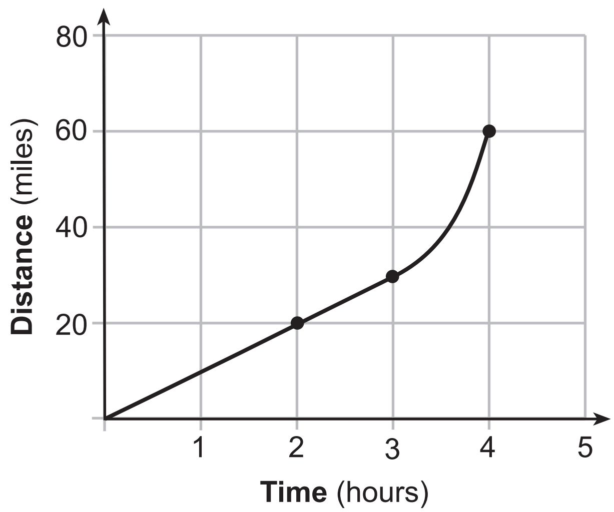


average rate of change = 20 mph

Score 1: The student did not show any work.

Question 25

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.



$\frac{20}{2} = 10$ mph

$\frac{25}{3} = 8.\overline{3}$ mph

$\frac{60}{4} = 15$ mph

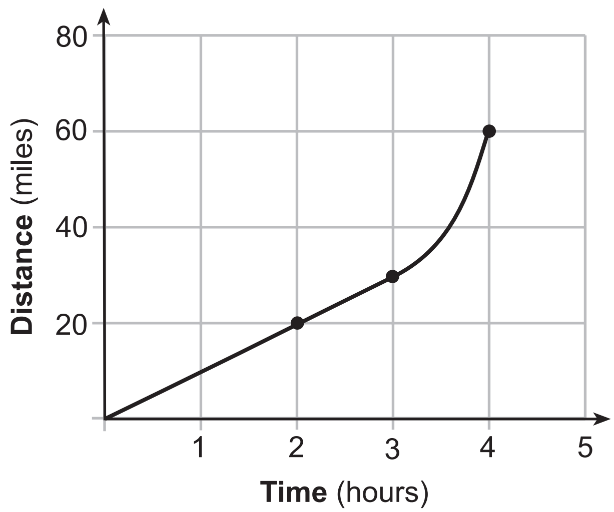
$10 + 8.\overline{3} + 15 = \frac{33.\overline{3}}{3}$

$\boxed{= 11.\overline{1} \text{ mph}}$

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

Question 25

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.



He increased by
40 miles

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

Question 26

26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

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

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

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

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

Question 26

26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

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

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

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

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

$$\begin{array}{ccc} x-3=0 & x+3=0 & x-2=0 \\ +3\ \ +3 & -3\ \ -3 & +2\ \ +2 \\ x=3 & x=-3 & x=2 \end{array}$$

$$x = \{-3, 2, 3\}$$

Score 1: The student found the roots after factoring completely.

Question 26

26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

$x^3 - 2x^2 - 9x + 18$

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

$(x-9)(x-2)$

Score 1: The student made a factoring error.

Question 26

26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

$x^3 - 2x^2 - 9x + 18$

$x(x^2 - 2x - 9 + 18)$

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

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

Score 0: The student made multiple factoring errors.

Question 26

26 Factor the expression $(x^3 - 2x^2) - (9x + 18)$ completely.

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

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

$$x^2+9=0$$
$$-9\quad -9$$
$$\sqrt{x^2}=\sqrt{-9}$$
$$\boxed{\pm 3i}$$

$$\boxed{x=2}$$

Score 0: The student made a factoring error and found the roots.

Question 27

27 Solve algebraically for all values of x:

$$\sqrt{4x+1} = 11 - x$$

$(\sqrt{4x+1})^2 = (11-x)^2$

$4x+1 = x^2 - 22x + 121$

$0 = x^2 - 26x + 120$

$(x-20)(x-6)$

$x = 20, 6$

$(11-x)(11-x)$

$121 - 11x - 11x + x^2$

$121 - 22x + x^2$

$\sqrt{4(20)+1} = 11-20$

$\sqrt{81} = -9$

$9 \neq -9$

$\sqrt{4(6)+1} = 11-6$

$\sqrt{25} = 5$

$5 = 5$

$\boxed{x = 6}$

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

Question 27

27 Solve algebraically for all values of x:

$$\left(\sqrt{4x + 1}\right)^2 = (11 - x)^2$$

$4x+1=(11-x)(11-x)$

$4x+1=121-11x-11x+x^2$

$4x+1=x^2-22x+121$

P: 120
S: −26
−6 · −20

$x^2-26x+120=0$

$(x^2-6x)(-20x+120)=0$

$x(x-6)+20(x-6)=0$

$(x-6)(x-20)=0$

$x=6$ $\cancel{x=20}$

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

Question 27

27 Solve algebraically for all values of x:

$$(\sqrt{4x + 1})^2 = (11 - x)^2$$

$(11-x)(11-x)$

$121-11x-11x+x^2$

$4x+1 = 121 + -22x + x^2$

$-4x-1 \quad -4x-1$

$0 = x^2-26x+120$

$0 = (x-20)(x-6)$

$x-20=0 \qquad x-6=0$

$+20 \; +20 \qquad +6 \; +6$

$x=20 \qquad x=6$

CHECK

$\sqrt{4x+1} = 11-x$

$\sqrt{4(20)+1} = 11-(20)$

$\sqrt{80+1}$

$\pm\sqrt{81} = 11-20$

$\pm 9 = 11-20$

$-9 \overset{\checkmark}{=} -9$

$\sqrt{4x+1} = 11-x$

$\sqrt{4(6)+1} = 11-(6)$

$\sqrt{25} = 11-6$

$5 \overset{\checkmark}{=} 5$

Score 1: The student made a computational error in the check for extraneous roots.

Question 27

27 Solve algebraically for all values of x:

$$\sqrt{4x + 1} = 11 - x$$

$x = 6$?

$\sqrt{4(6)+1} = 11-6$

$\sqrt{25} = 5$

$5 = 5$

$x = 5$

$\boxed{x = 6}$

$14 \pm \sqrt{176}$

$14 \pm 4\sqrt{11}$

Score 1: The student received credit for stating 6.

Question 27

27 Solve algebraically for all values of x:

$$\sqrt{4x + 1} = 11 - x$$

$(\sqrt{4x+1})^2 = (11-x)^2 (11-x)$

$4x+1 = -x^2 - 11x - 11x + 121$

$4x+1 = -x^2 - 22x + 121$

$+x^2 + 22x - 121$

$x^2 + 26x - 120 = 0$

$\cancel{(x+4)(x-30)}$

$(x+30)(x-4) = 0$

$\cancel{x = -30, 4}$

$\boxed{\text{No Solutions}}$

Check

$\sqrt{4(-30)+1} = 11-(-30)$

$\cancel{\sqrt{-119} = -41}$

$\sqrt{4(4)+1} = 11-4$

$\cancel{\sqrt{17} = 7}$

Score 1: The student made one computational error.

Question 27

27 Solve algebraically for all values of x:

$$\sqrt{4x+1}^2 = 11 - x^2$$

$4x+1 = -x^2+121$

$+x^2 \quad +x^2$

$x^2+4x+1 = 121$

$-121 \quad -121$

A B C

$x^2+4x-120=0$

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

$= \dfrac{\cancel{-4} \pm \sqrt{16-4(1)(-120)}}{\cancel{2}}$ -2

496

2 248

2 124

2 62

2 31

$x = -2 \pm \sqrt{496}$

$\boxed{x = -2 \pm 2\sqrt{31}}$

Score 0: The student made multiple errors.

27 Solve algebraically for all values of x:

$$\sqrt{4x + 1} = 11 - x$$

$4x+1=(11-x)^2$

$4x+1=121-22x-x^2$

$26x=120-x^2$

$0=-x^2-26x+120$

$x^2+26x-120$

$(x-4)(x+30)$

$x=4 \qquad x=-30$

$(11-x)(11-x)$

$121-11x-11x-x^2$

$121-22x-x^2$

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

Question 28

28 Given that $\left(\dfrac{y^{\frac{17}{8}}}{y^{\frac{5}{4}}}\right)^{-4} = y^n$, where $y > 0$, determine the value of n.

$$\left(\frac{y^{17/8}}{y^{10/8}}\right)^{-4}$$

$$\left(y^{7/8}\right)^{-4}$$

$$y^{-7/2}$$

$$n = -7/2$$

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

Question 28

28 Given that $\left(\dfrac{y^{\frac{17}{8}}}{y^{\frac{5}{4}}}\right)^{-4} = y^n$, where $y > 0$, determine the value of n.

$$\left(\frac{y^{\frac{10}{8}}}{y^{\frac{17}{8}}}\right)^4$$

$$\left(y^{-\frac{7}{8}}\right)^4$$

$$y^{-\frac{7}{2}}$$

so $n = -\frac{7}{2}$

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

Question 28

28 Given that $\left(\dfrac{y^{\frac{17}{8}}}{y^{\frac{5}{4}}}\right)^{-4} = y^n$, where $y > 0$, determine the value of n.

$y^{\frac{12}{4}}$

$n = -12$

$(y^3)^{-4}$

y^{-12}

Score 1: The student made a computational error.

Question 28

28 Given that $\left(\dfrac{y^{\frac{17}{8}}}{y^{\frac{5}{4}}}\right)^{-4} = y^n$, where $y > 0$, determine the value of n.

$$\left(\frac{y^{\frac{17}{8}}}{y^{\frac{10}{8}}}\right)^{-4}$$

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

Question 29

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.

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

cot $\frac{A}{O}$

$\cos A = \frac{3 \text{ adj.}}{\sqrt{10} \text{ hyp.}}$

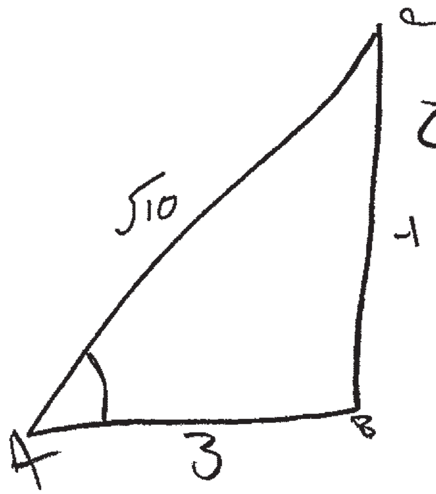
$\cot A = \frac{3 \text{ adj.}}{-1 \text{ opp.}}$

$\boxed{\sin A = \frac{-1}{\sqrt{10}}}$

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

Question 29

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.

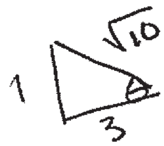


Q IV $\frac{-1}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}}$

$$\boxed{\frac{-\sqrt{10}}{10}}$$

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

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.



$3^2 + b^2 = \sqrt{10}^2$

$\cancel{9} + b^2 = 10$

$-\cancel{9} \quad -9$

$\sqrt{b^2} = \sqrt{1}$

$b = 1$

$\sin A = \frac{1 \cdot \sqrt{10}}{\sqrt{10} \cdot \sqrt{10}} = \frac{\sqrt{10}}{10}$

Score 1: The student ignored the sign of the function in Quadrant IV.

Question 29

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.

$\cos A = 3/\sqrt{10}$

$(\cos(A))^2 + (\sin(A))^2 = 1$

$(3/\sqrt{10})^2 + (\sin(A))^2 = 1$

$0.9 + (\sin(A))^2 = 1$

$\sqrt{(\sin(A))^2} = \sqrt{0.1}$

$\boxed{\sin A = \sqrt{0.1}}$

Score 1: The student ignored the sign of the function in Quadrant IV.

Question 29

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.

$\frac{\cos}{\sin}$

$\sin A = -.316$

$-3 = \frac{\frac{3}{\sqrt{10}}}{x}$

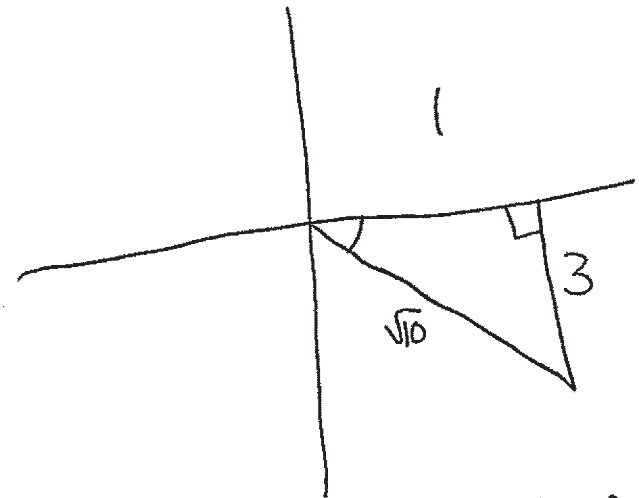
$-3x = \frac{3}{\sqrt{10}}$

$\frac{-3x}{-3} = \frac{.948}{-3}$

Score 1: The student did not give the value in radical form.

Question 29

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.



$\sin A = \frac{(1)^2}{(\sqrt{10})^2}$

$\sin A = \frac{1}{10}$

$9 + x^2 = 10$
$-9 \quad -9$
$\sqrt{x^2} = \pm\sqrt{1}$
$x = 1$

Score 0: The student made multiple errors.

Question 30

30 According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the *nearest integer*, approximately how many babies weighed more than 4 kg.

normalcdf(4, 100000, 3.39, .55) = 0.1336...

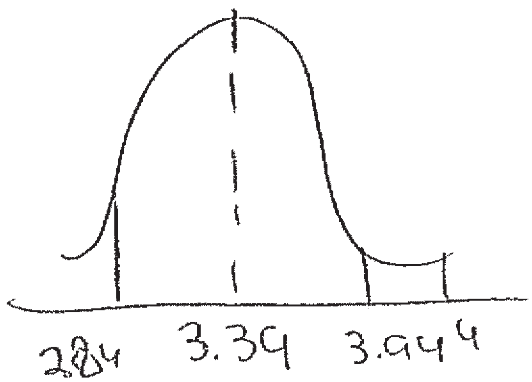
0.1336... • 9256 =

1,237 babies born last year weighed more than 4 kg.

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

Question 30

30 According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the *nearest integer*, approximately how many babies weighed more than 4 kg.



NormalCDF:

LB: 4

UB: ∞

μ: 3.39

σ: .55

1237 babies

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

Question 30

30 According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the *nearest integer*, approximately how many babies weighed more than 4 kg.

mean

normal cdf (4, 1000, 3.39, 0.55)

0.1336955 ~~x 100 = 13.6955%~~

9256 × ↑ = 1238 babies

Score 1: The student rounded incorrectly.

Question 30

30 According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the *nearest integer*, approximately how many babies weighed more than 4 kg.

normalcdf(4, ∞, 0.55, 3.39)

$\boxed{\text{1388 babies}}$

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

31 The table below shows the results of gender and music preference. Based on these data, determine if the events "the person is female" and "the person prefers classic rock" are independent of each other. Justify your answer.

	Rap	Techno	Classic Rock	Classical
Male	39	17	42	12
Female	17	37	36	15

215

$P(F \text{ and } CR) = P(F) \cdot P(CR)$

$\frac{36}{215} = \frac{105}{215} \cdot \frac{78}{215}$

$0.1674418605 \neq 0.1771768524$

$P(F | CR) = P(F)$

$\frac{36}{78} = \frac{105}{215}$

$0.4615384615 \neq 0.488372093$

$\boxed{\text{No, the events are not independent of each other because the probabilities are different}}$

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

31 The table below shows the results of gender and music preference. Based on these data, determine if the events "the person is female" and "the person prefers classic rock" are independent of each other. Justify your answer.

	Rap	Techno	Classic Rock	Classical	
Male	39	17	42	12	110
Female	17	37	36	15	105
	56	54	78	27	215

$A|B=A$

$\frac{105}{215}=.488372093$

$\frac{36}{78}=.4615384615$

no, not independant

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

31 The table below shows the results of gender and music preference. Based on these data, determine if the events "the person is female" and "the person prefers classic rock" are independent of each other. Justify your answer.

independence

	Rap	Techno	Classic Rock	Classical	
Male	39	17	42	12	110
Female	17	37	36	15	105

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

$\frac{105}{215} = \frac{36}{105}$

$.488 \times .34285 \times$

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

$\frac{78}{215} = \frac{36}{78}$

$\times .36279 \times .46$

The events "the person is female" and "the person prefers classic rock" are not idependent of each other because using the equation P(A) = P(B|A) the probabilities are not equal.

Score 1: The student stated a correct conclusion based on an incorrect test for independence.

Question 31

31 The table below shows the results of gender and music preference. Based on these data, determine if the events "the person is female" and "the person prefers classic rock" are independent of each other. Justify your answer.

	Rap	Techno	Classic Rock	Classical
Male	39	17	42	12
Female	17	37	36	15

Classic rock

$M = \frac{42}{110} \times 100$

$F = \frac{36}{105} \times 100$

M = % males that like classic rock

F = % females that like classic rock

$M = 38.\overline{18}\,\%$

$F = 34.28\ldots\%$

Females are not more likely to like classic rock, ∴ the events are independant.

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

31 The table below shows the results of gender and music preference. Based on these data, determine if the events "the person is female" and "the person prefers classic rock" are independent of each other. Justify your answer.

	Rap	Techno	Classic Rock	Classical	
Male	39	17	42	12	110
Female	17	37	36	15	105
	56	54	78	27	215

not independent

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

$$\frac{105}{215} + \frac{78}{215} = \frac{15}{27}$$

$$.488 + .3627 = .555$$

$$.8511$$

Score 0: The student made multiple errors.

32 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$
$$y = 11 - 2x$$

$2x^2 - 7x + 4 = \cancel{11} - \cancel{2x}$
$+2x - 11 \quad -\cancel{11} + \cancel{2x}$

$2x^2 - 5x - 7 = 0$

$(2x - 7)(x + 1) = 0$ $\qquad -7x \; +2x$

$2x - 7 = 0 \qquad x + 1 = 0$

$2x = 7 \qquad x = -1$

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

$y = 11 - 2(-1)$

$y = 11 + 2$

$y = 13$

$y = 11 - 2\left(\frac{7}{2}\right)$

$= 11 - \frac{14}{2}$

$= \frac{22 - 14}{2}$

$= \frac{8}{2}$

$y = 4$

solution

$x, y\,(-1, 13)$

$x, y\,\left(\frac{7}{2}, 4\right)$

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

Question 32

32 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$
$$y = 11 - 2x$$

$y = 11 - 2x$

$y = 11 - 2(3.5)$ or $y = 11 - 2(-1)$

$11 - 2x = 2x^2 - 7x + 4$

$-11 + 2x \quad\quad +2x - 11$

$y = 4$ or $y = 13$

$2 \cdot -7 = -14$

$-7 + 2$

$0 = 2x^2 - 5x - 7$

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

$2x(x+1) - 7(x+1)$

$(3.5, 4) \quad (-1, 13)$

$(2x - 7)(x+1)$

$2x - 7 = 0 \quad\quad x + 1 = 0$

$+7 \; +7$

$\frac{2x = 7}{2}$ or $x = -1$

$x = 3.5$

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

32 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$
$$y = 11 - 2x$$

$11 - 2x = 2x^2 - 7x + 4$

$-11 \; +2x \qquad -11 \; +2x$

$0 = 2x^2 - 5x - 7$

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

$2x = 7$

$\boxed{x = 7/2}$

$\boxed{x = -1}$

$x = -1, 7/2$

$Y = 4, 13$

Score 1: The student did not clearly indicate the solution set.

32 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$
$$y = 11 - 2x$$

$11 - 2x = 2x^2 - 7x + 4$

$-11 + 2x \quad\quad +2x - 11$

$y = 11 - 2(7.1)$

$y = 4$

$0 = 2x^2 - 5x - 7$

-14

$-7 \quad 2$

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

$x(2x-7) + 1(2x-7)$

$(x+1)(2x-7)$

$x+1=0 \quad\quad 2x-7=0$

$-1 \;\; -1 \quad\quad +7 \;\; +7$

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

$x = 3.5$

$(3.5, 4)$

Score 1: The student did not find both solutions.

Question 32

32 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$
$$y = 11 - 2x$$

$11 - 2x = 2x^2 - 7x + 4$

$2x^2 + 5x - 7 = 0$

$2x^2 - 2x + 7x - 7 = 0$

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

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

$\boxed{x = \frac{7}{2} \quad x = -1}$

$y = 11 - 2(\frac{7}{2}) \rightarrow 4$

$y = 11 - 2(1) \rightarrow 9$

$(\frac{7}{2}, 4)$

$(1, 9)$

Score 0: The student made multiple computational errors.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p, on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11{,}000(2)^{\frac{t}{20}}$$

b) Using $p(t)$ from part a, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$1{,}000{,}000 = 11{,}000\left(2^{\frac{t}{20}}\right)$$

$$90.90909 = 2^{\frac{t}{20}}$$

$$\log 90.90909 = \log 2^{\frac{t}{20}}$$

$$= \frac{t}{20}\log 2$$

$$t = \frac{20\log 90.90909}{\log 2} \approx 130.13$$

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

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p, on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$A = Pe^{rt}$

$\ln 2 = \ln e^{20r}$

$\ln 2 = 20r$

$r = \frac{\ln 2}{20}$

$\boxed{p(t) = 11{,}000e^{\left(\frac{\ln 2}{20}\right)t}}$

b) Using $p(t)$ from part a, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$1{,}000{,}000 = 11{,}000e^{\left(\frac{\ln 2}{20}\right)t}$

$\ln 90.91 = \ln e^{\left(\frac{\ln 2}{20}\right)t}$

$\ln 90.91 = \frac{\ln 2 t}{20}$

$\frac{(\ln 90.91)(20)}{\ln 2} = \frac{\ln 2 t}{\ln 2}$

$\boxed{t = 130.13 \text{ minutes}}$

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

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p, on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11000(2)^t$$

b) Using $p(t)$ from part a, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$11000(2)^t = 1000000$$

$$\log 2^t = \log \frac{1000000}{11000}$$

$$t = \frac{\log \frac{1000000}{11000}}{\log 2}$$

$$t = 6.51$$

Score 3: The student made an error in the exponent in part a.

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p, on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11{,}000(2)^{\frac{t}{20}}$$

b) Using $p(t)$ from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$1{,}000{,}000 = \overset{22{,}000}{11\cancel{,000(2)}}^{\frac{t}{20}}$$

$$\frac{\log(1{,}000{,}000)}{\log(22{,}000)} = \frac{\frac{t}{20}\log(22{,}000)}{\log(22{,}000)}$$

$$\frac{1.381717175}{1} = \frac{t}{20}$$

$$t = 27.6343435$$

$$t = 27.6 \text{ minutes}$$

Score 2: The student multiplied 11,000 by 2 and made a rounding error.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p, on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11{,}000(2)^{\frac{t}{20}}$$

b) Using $p(t)$ from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$\frac{1{,}000{,}000}{11{,}000} = \frac{11{,}000(2)^{\frac{t}{20}}}{11{,}000}$$

$\times 1 = 11{,}000$

20 22000

403 = 44000

2604 = 88000

2805 = 176000

$\times$ 4006 = 352000

1207 = 704000

1406 = 1408000

$90.9 = 2^{\frac{t}{20}}$

$1.25 = 2^{x}$

$t \approx 130.67$

Score 2: The student only received credit for part *a*.

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p, on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11{,}000(1+2)^{\frac{t}{20}}$$

b) Using $p(t)$ from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$1{,}000{,}000 = 11{,}000(1+2)^{\frac{t}{20}}$$

$$90.909 = (1+2)^{\frac{t}{20}}$$

$$90.909 = (3)^{\frac{t}{20}}$$

Score 1: The student had an incorrect base in part *a* and did not show enough further correct work.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p, on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$p(t) = 11000(2)^t$

t = every 20 mins

b) Using $p(t)$ from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

6.51 x20

130.20 minutes

Score 1: The student received 1 credit for the equation in part *a*.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p, on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$P = 11{,}000 \cdot \left(\tfrac{1}{2}\right)^t$$

b) Using $p(t)$ from part a, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

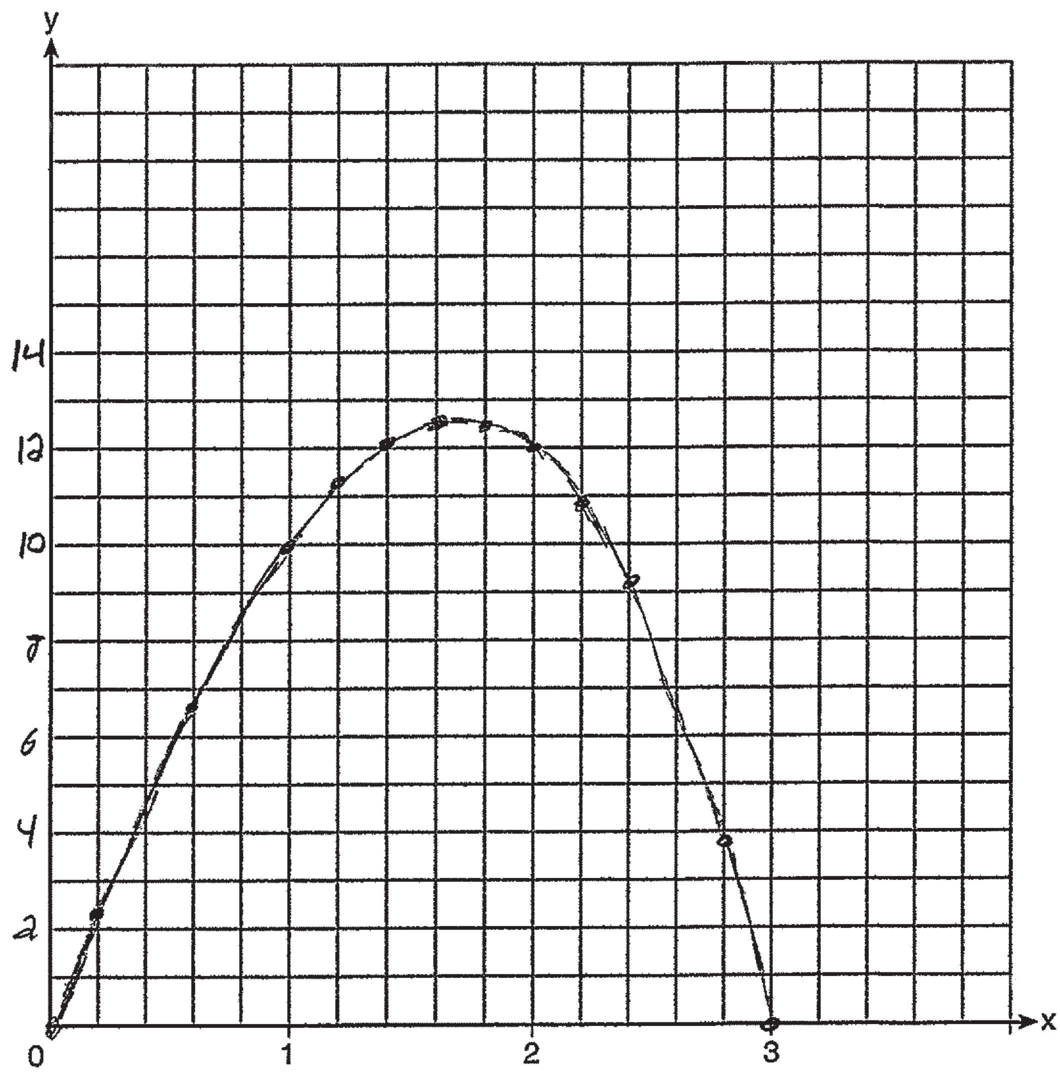
$$1{,}000{,}000 = 11{,}000 \left(\tfrac{1}{2}\right)^t$$
$$1{,}000{,}000 = 22000^t$$
$$\log_{22000}(1{,}000{,}000) = t$$
$$t = 138.17 \text{ minutes}$$

Score 0: The student made multiple errors in the equation and solution.

Question 34

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

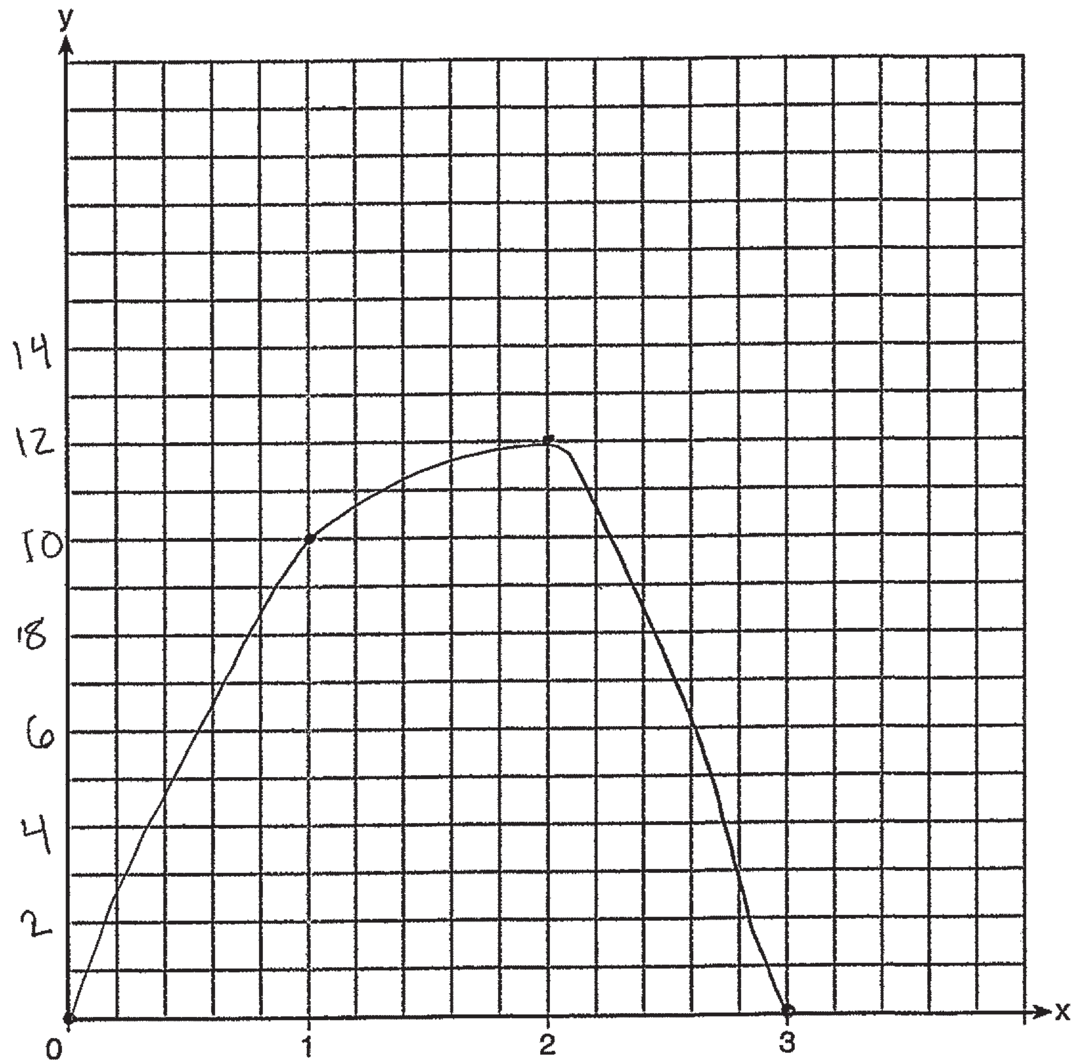
12.6

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

Question 34

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \le x \le 3$.

Graph $y = v(x)$ over the domain $0 \le x \le 3$.



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

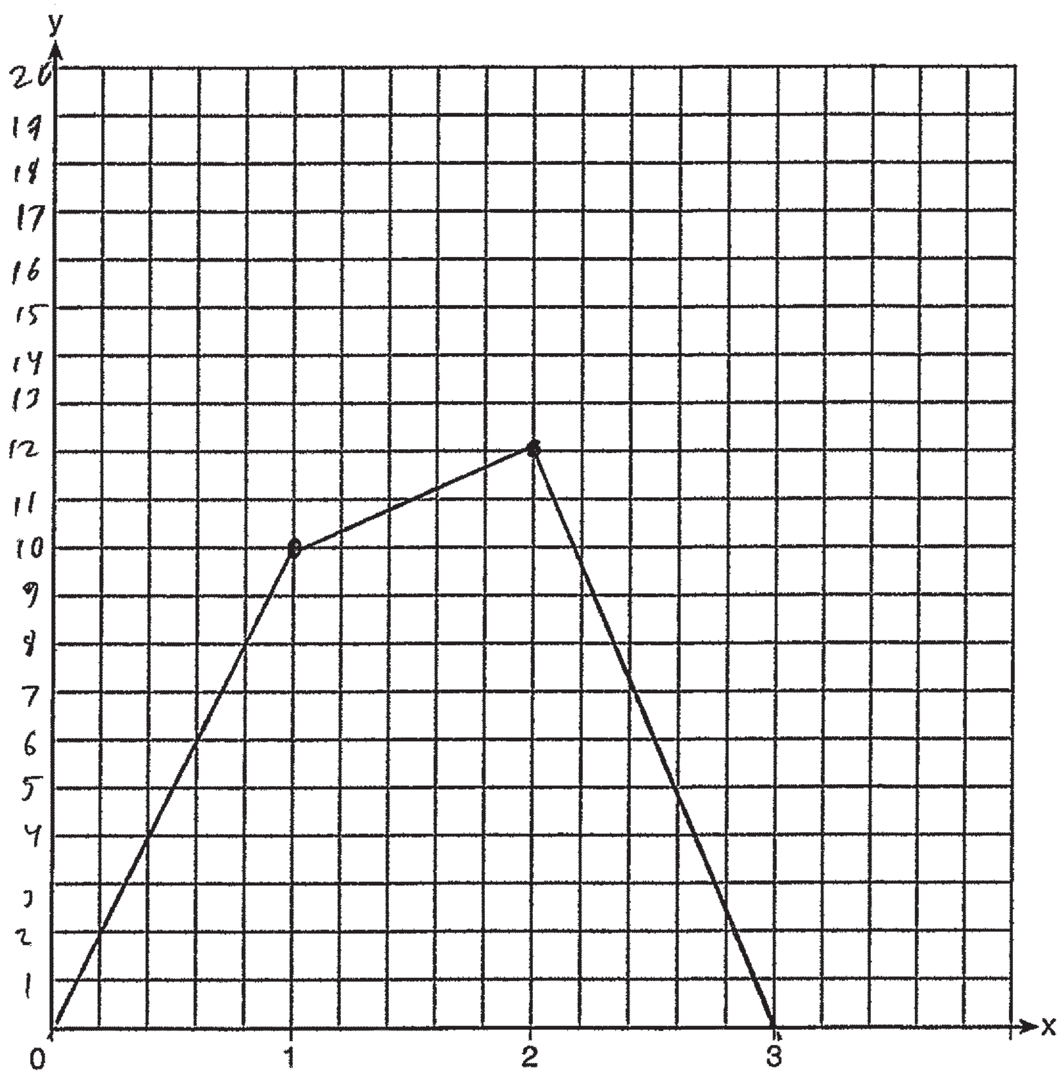
$\boxed{\text{Max} = 12.6}$

Score 3: The student made a graphing error at the maximum.

Question 34

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

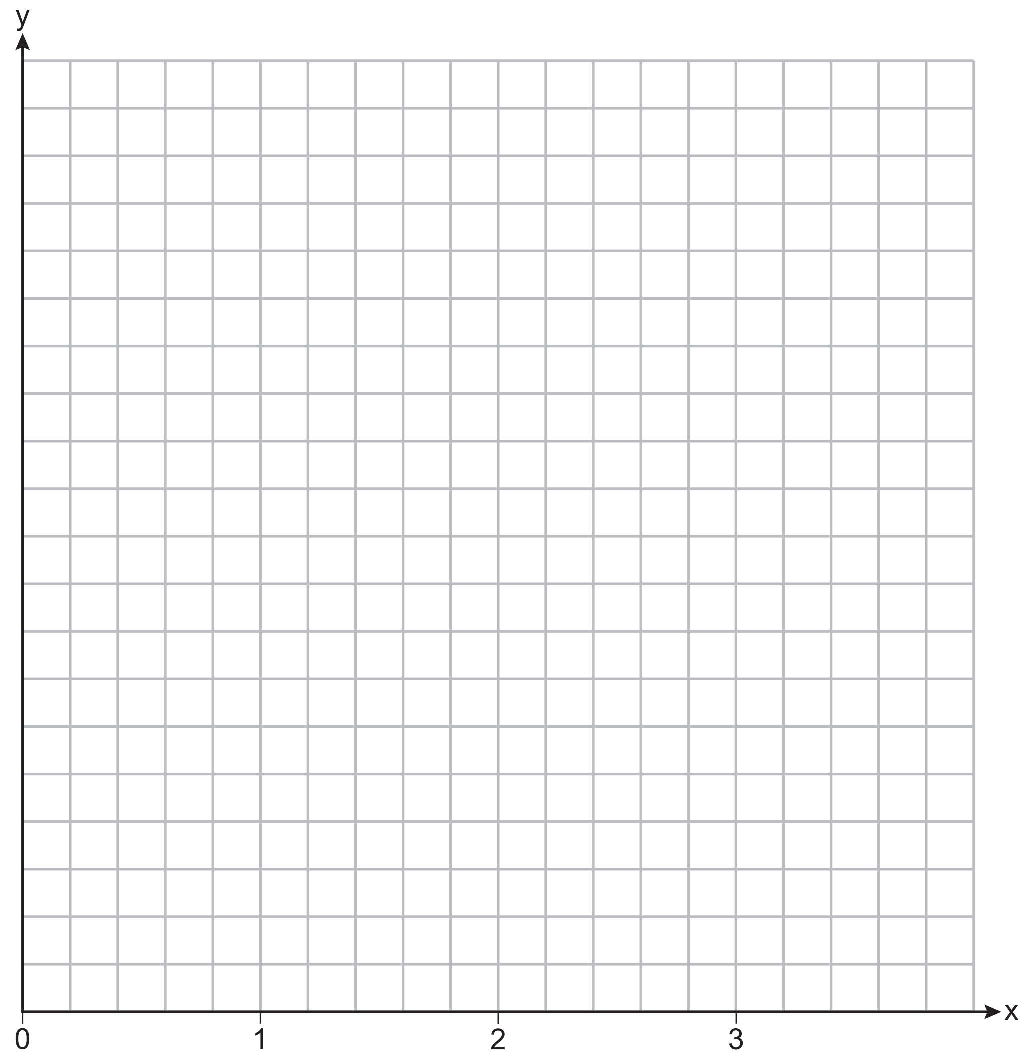
It is 12.6.

Score 2: The student only received credit for stating the maximum.

Question 34

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

(1.7, 12.6)

Score 1: The student stated the coordinates of the maximum.

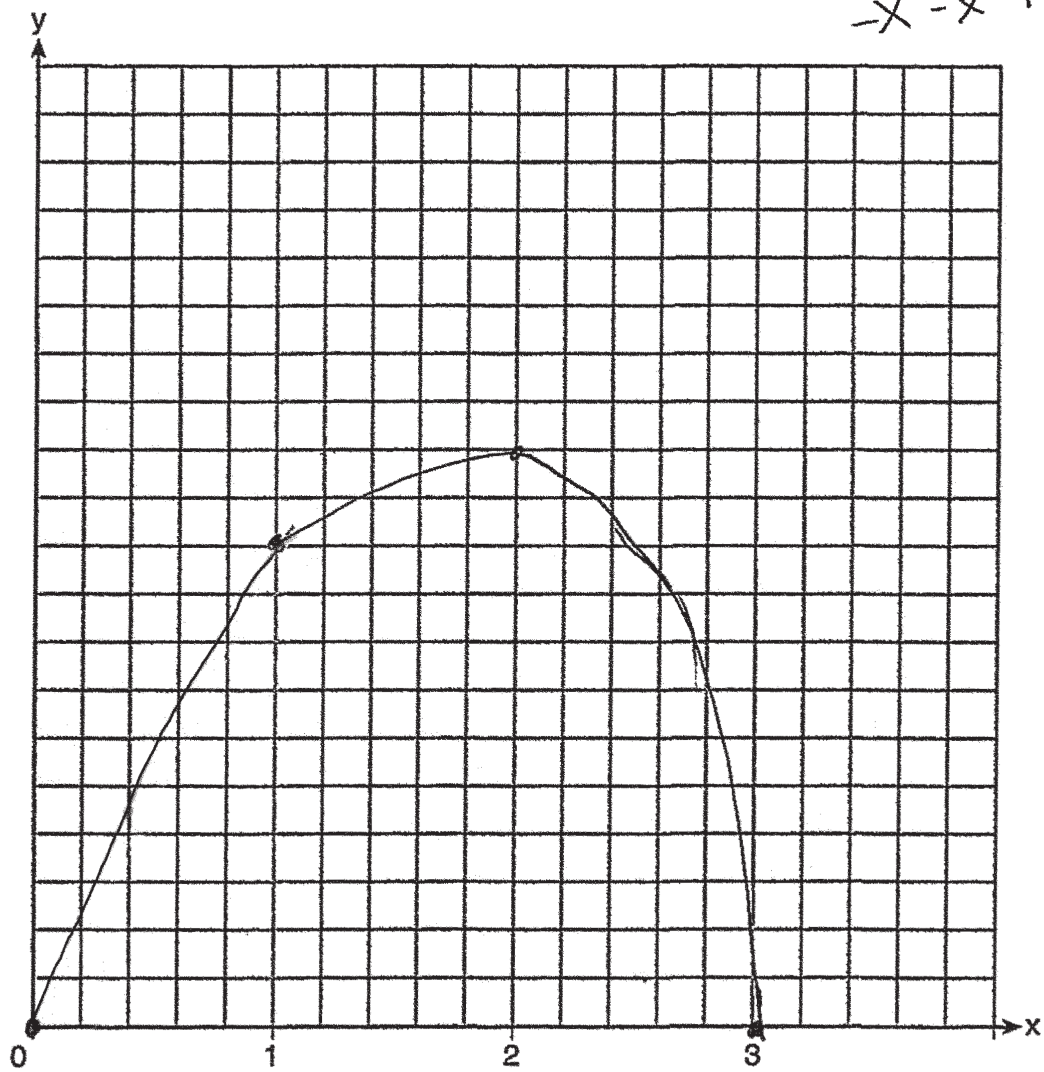
34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.

	3	$-x$	
	$3x$	$-x^2$	x
	12	$-4x$	$+4$

$x(-x^2 - x + 12)$

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



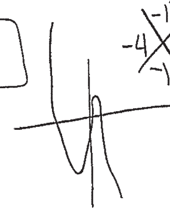
To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

$x(-x^2 - x + 12)$

$\cancel{(x-4)(x+3)}$

$\cancel{x=4}$ $\cancel{x=-3}$

$\boxed{48.7}$



-12

-4 3

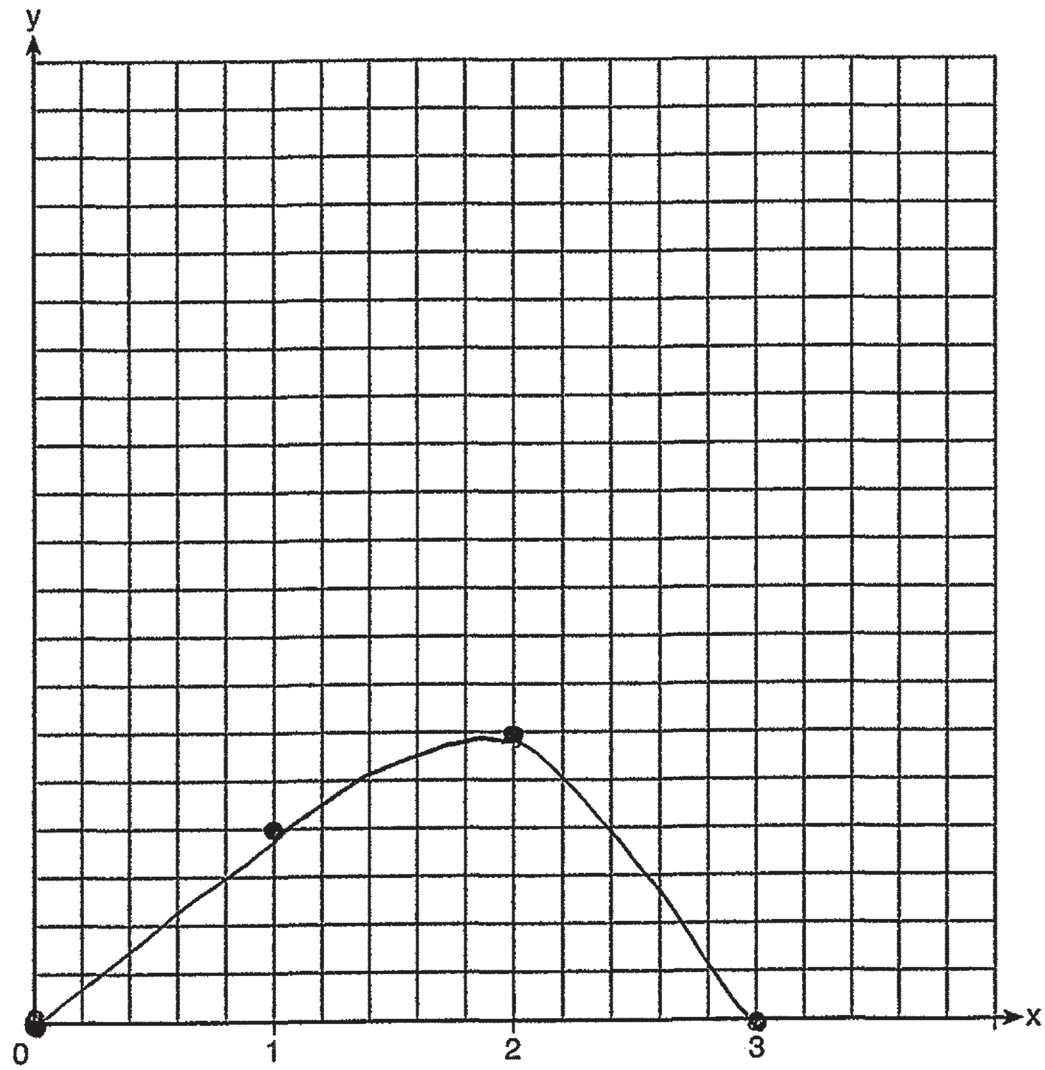
-1

Score 1: The student did not graph the correct maximum and showed no further correct work.

Question 34

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \le x \le 3$.

Graph $y = v(x)$ over the domain $0 \le x \le 3$.



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

The maximum volume was 12.0 .4

Score 0: The student made multiple graphing errors and the maximum is incorrectly stated.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$\begin{array}{r} 3x^2 + 8x + 34 \\ x-4 \overline{) 3x^3 - 4x^2 + 2x - 1} \\ -(3x^3 - 12x^2) \\ \hline 8x^2 + 2x \\ -(8x^2 - 32x) \\ \hline 34x - 1 \\ -(34x - 136) \\ \hline 135 \end{array}$$

$$3x^2 + 8x + 34 + \frac{135}{x-4}$$

Is $x = 4$ a root of $f(x)$? Explain your answer.

no, because when you divide by x-4 you get a remainder of 135 and not a remainder of 0.

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

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$\begin{array}{r|rrrr} 4 & 3 & -4 & 2 & -1 \\ & \downarrow & 12 & 32 & 136 \\ \hline & 3 & 8 & 34 & 135 \end{array}$$

$$\boxed{3x^2 + 8x + 34 + \frac{135}{x-4}}$$

Is $x = 4$ a root of $f(x)$? Explain your answer.

no because when f(x) was divided by x-4 there was a remainder

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

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$
\begin{array}{r|l}
 & 3x^2+8x+34 \\
\hline
x-4 & 3x^3-4x^2+2x-1 \\
 & -\,3x^3-12x^2 \\
\hline
 & 8x^2+2x-1 \\
 & -\,8x^2-32x \\
\hline
 & 34x-1 \\
 & -\,34x-136 \\
\hline
 & 135
\end{array}
$$

$$\boxed{3x^2+8x+34 \ \frac{135}{x-4}}$$

Is $x = 4$ a root of $f(x)$? Explain your answer.

NO. when 4 is substituted for x, it does not equal to zero meaning it is not a root

Score 3: The student did not write the quotient and remainder in the correct form.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$
\begin{array}{r}
3x^2 - 16x - 62 \\
x-4 \overline{\big) 3\cancel{x^3} - 4x^2 + 2x - 1} \\
-\ \cancel{3x^3} + 12x^2 \\
\hline
-16\cancel{x^2} + 2x \\
-\ -\cancel{16x^2} + 64x \\
\hline
-62x - 1 \\
-\ -62x + 248 \\
\hline
-249
\end{array}
$$

$$\boxed{3x^2 - 16x - 62 - \frac{249}{x-4}}$$

Is $x = 4$ a root of $f(x)$? Explain your answer.

No, $x = 4$ is not a root of $f(x)$ because there is a remainder.

Score 3: The student made a computational error in the long division.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

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

Is $x = 4$ a root of $f(x)$? Explain your answer.

No it is not
Because f(4) does not
equal zero

Score 2: The student wrote a correct explanation but showed no further correct work.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

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

$-x^2$

Is $x = 4$ a root of $f(x)$? Explain your answer.

$f(4) = 3(4)^3 - 4(3)^2 + 2(4) - 1$

$= 163$

No, becau $f(4) \neq 0$

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

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$g(x) = x - 4$

Answer: $4x^2 + 12x + 50 + \frac{199}{x-4}$

$$\begin{array}{r|rrrr} 4 & 3 & -4 & 2 & -1 \\ & 1 & 16 & 48 & 200 \\ \hline & 4 & 12 & 50 & 199 \end{array}$$

$4x^2 + 12x + 50$

Is $x = 4$ a root of $f(x)$? Explain your answer.

Score 1: The student has one computational error in the synthetic division and showed no further correct work.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$g(x) = x - 4$

$F(x) = 3x^3 - 4x^2 + 2x - 1$

$F(x) = 3x^3 - 4x^2 + 2(-4) - 1$

$F(x) = 3x^3 - 4x^2 - 8 - 1$

$F(x) = 3x^3 - 4x^2 - 9$

Is $x = 4$ a root of $f(x)$? Explain your answer.

NO because it can't go in to 0.

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

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$g(x)$

$$\begin{array}{r|l} & 3x^2 - 4x + 2 \\ + \; x+4 & 3x^3 - 4x^2 + 2x - 1 \\ & -3x^3 \\ & \quad 0 - 4x^2 \\ & \quad -4x^2 \\ & \quad\quad 0 + 2x \\ & \quad\quad -2x \\ & \quad\quad\quad 0 - 1 \\ & \quad\quad\quad -1 \end{array}$$

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

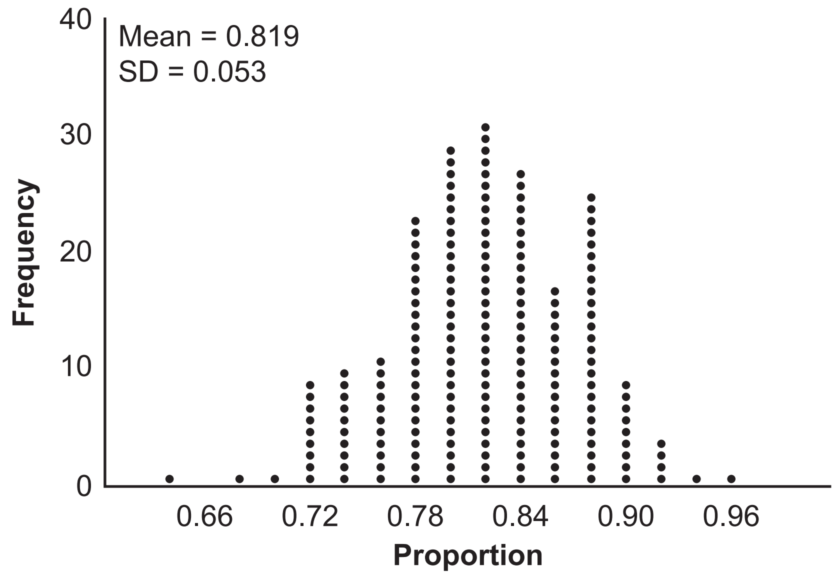
Is $x = 4$ a root of $f(x)$? Explain your answer.

no, bc, f(x)=0 cant be graphed, the roots would be imaginary.

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

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

$0.819 \pm 2(.053)$

$0.713 - 0.925$

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

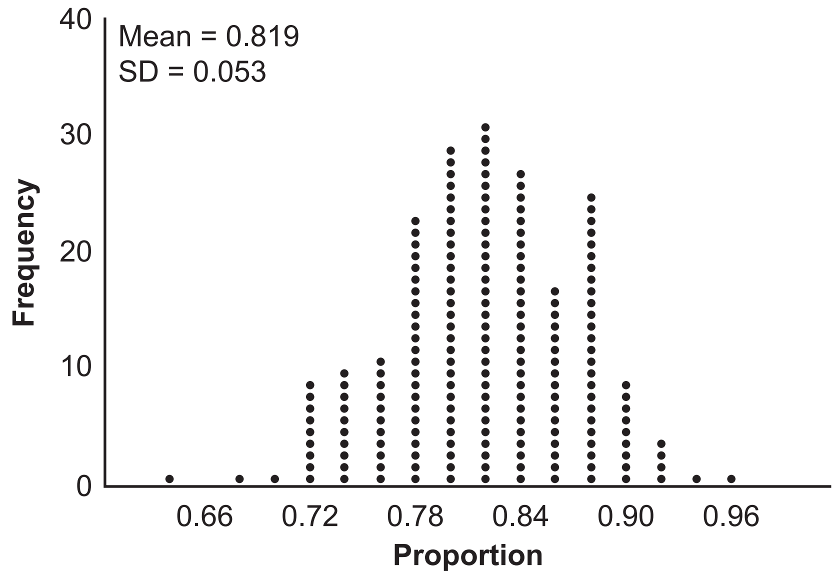
71.3% – 92.5%

The organization should question the State officials clam because 70% is outside of the 95% interval,

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

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

95% ± 2

.053 × 2 = .106

.819 − .106 = .713

.819 + .106 = .925

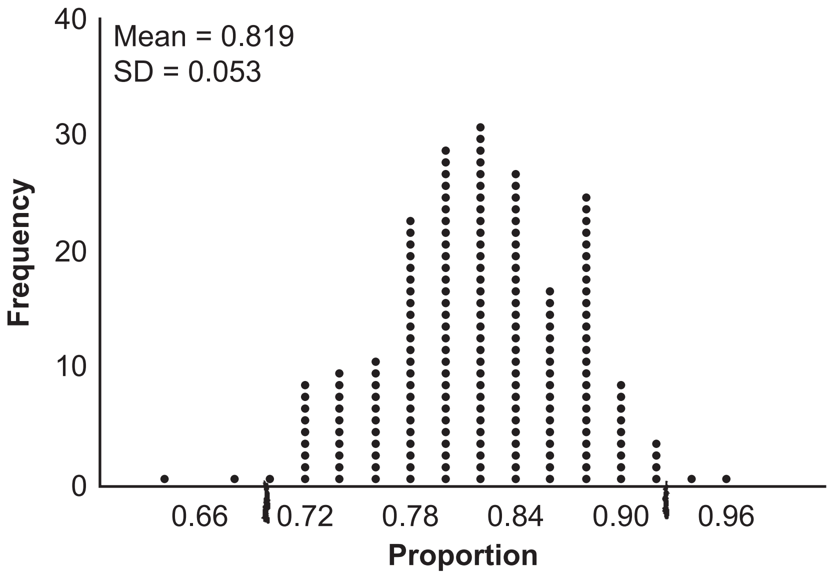
.713 - .925

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

They should question the claim because their survey results are outside the range of plausible proportions.

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

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

$0.819 \pm 2(0.053) <$ $0.819 + 2(0.053) = 0.925$ / $0.819 - 2(0.053) = 0.713$

$\boxed{0.713 \pm 0.925}$

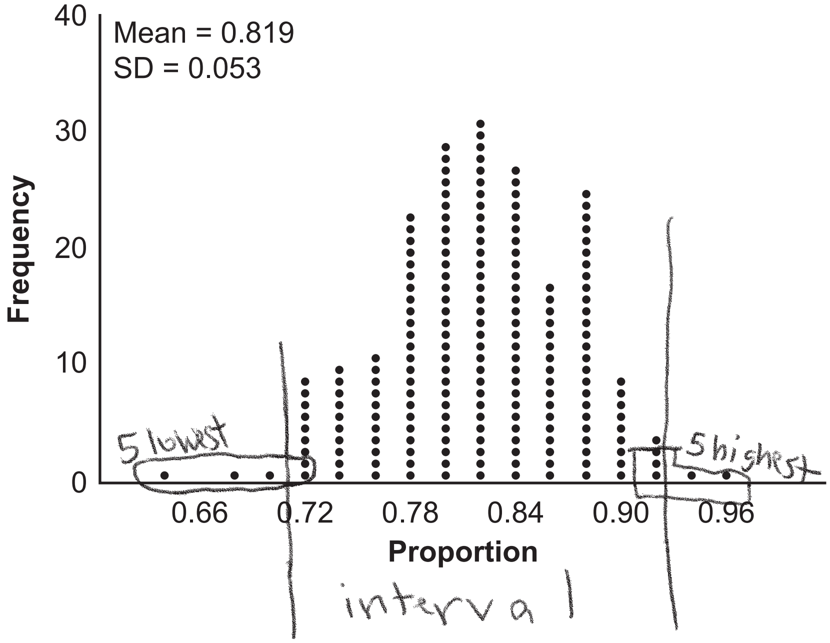
The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

The organization should question the state official's claim because this 70% support does not fall into the 95% plausible proportions (lower than 71.3%)

Score 3: The student did not state a correct interval.

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



$$\begin{array}{r} 200 \\ \times\ .95 \\ \hline 190 \end{array}$$

$$\begin{array}{r} 200 \\ -190 \\ \hline 10 \end{array}$$

$$\frac{10}{2} = 5$$

Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

.72 – .92

.70

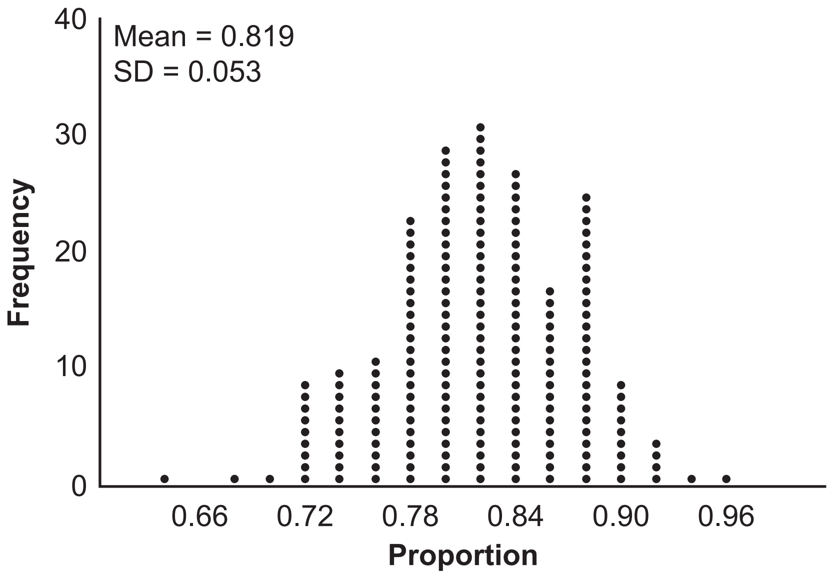
The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

The officials' claim should be questioned because .70 is outside the interval .72 - .92.

Score 3: The student did not round the interval to the nearest thousandth.

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

$(.819) + 2(.053) = .925$

$(.819) - 2(.053) = .713$

$\boxed{.713 - .925}$

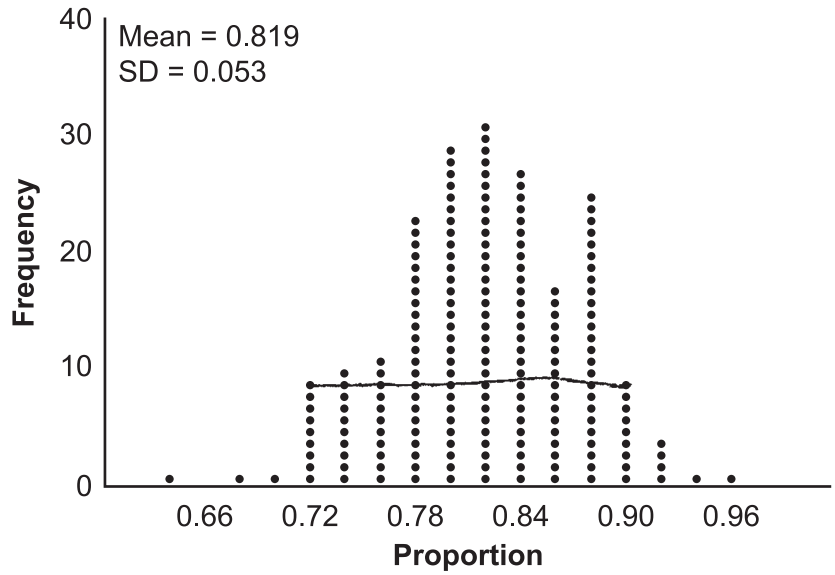
The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

70% is lower than the mean of 81.9%

Score 2: The student stated a correct interval but showed no further correct work.

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

0.819 ± 2(0.053)
= 0.925
= 0.713

0.925 0.713

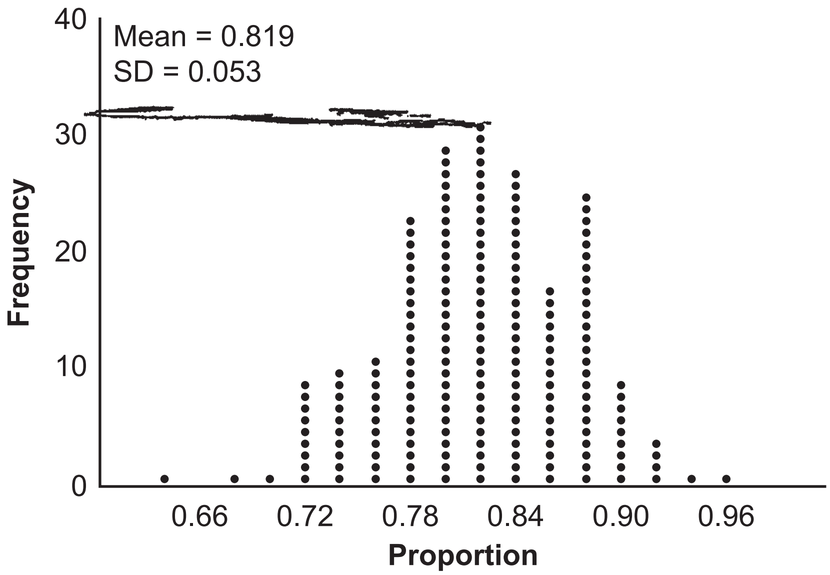
The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

Because the dot graph does not show that 70% supported the repeal.

Score 1: The student wrote the interval incorrectly.

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

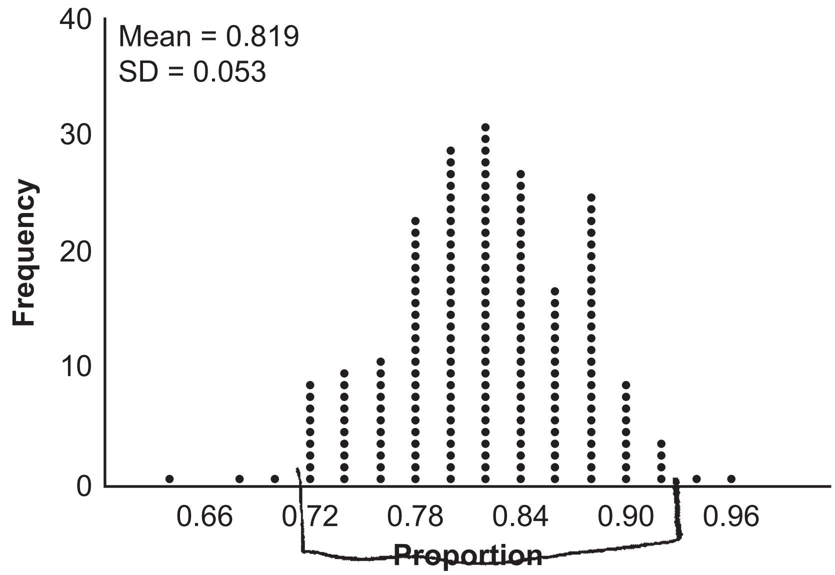
$$\frac{31\%}{95\%} = \frac{.31}{.0095} = \boxed{32.6}$$

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

They should question the state officials claim because it is wrong and it states that 70% of the community supported the repeal.

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

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

0.72 - 0.90

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim. The organization should question the State officials claim because They had a 12% difference in results.

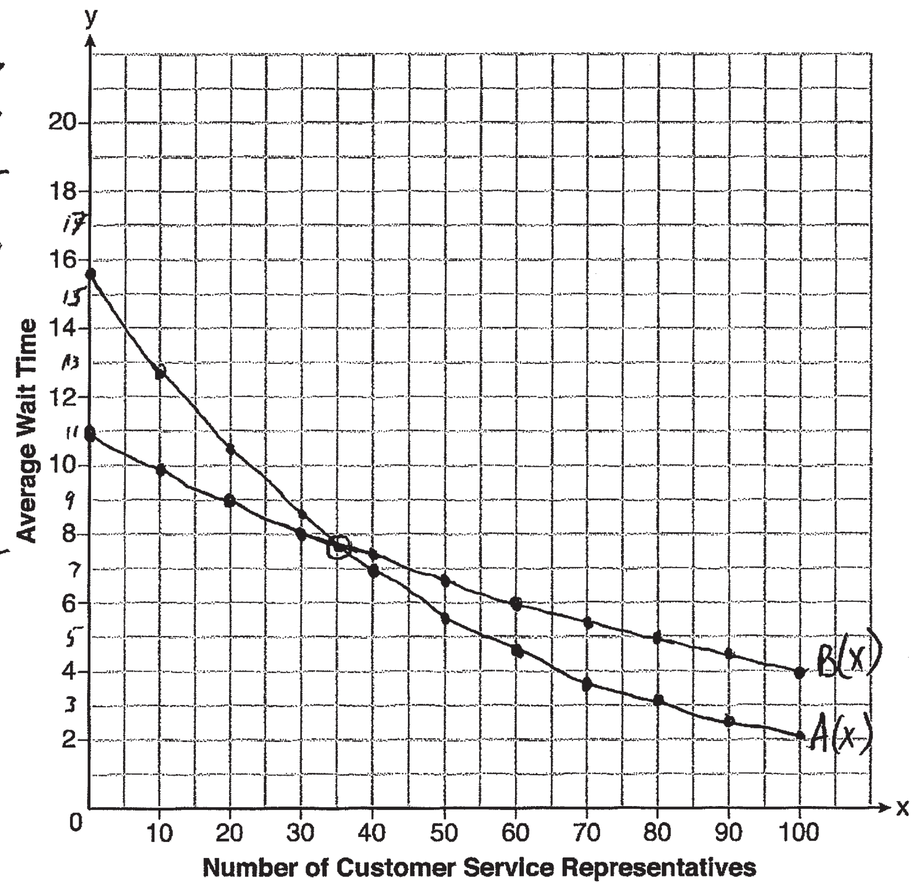
Score 0: The student did not give a correct interval and wrote an incorrect explanation.

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.

x	$A(x)$
0	15.7
10	12.8
20	10.5
30	8.6
40	7
50	5.7
60	4.7
70	3.8
80	3.1
90	2.5
100	2.1



x	$B(x)$
0	11
10	9.9
20	9
30	8.1
40	7.4
50	6.7
60	6
70	5.4
80	4.9
90	4.5
100	4

Question 37 is continued on the next page.

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

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$x = 35$

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

$B(100) = 4.0264$

$A(100) = -\,2.0812$

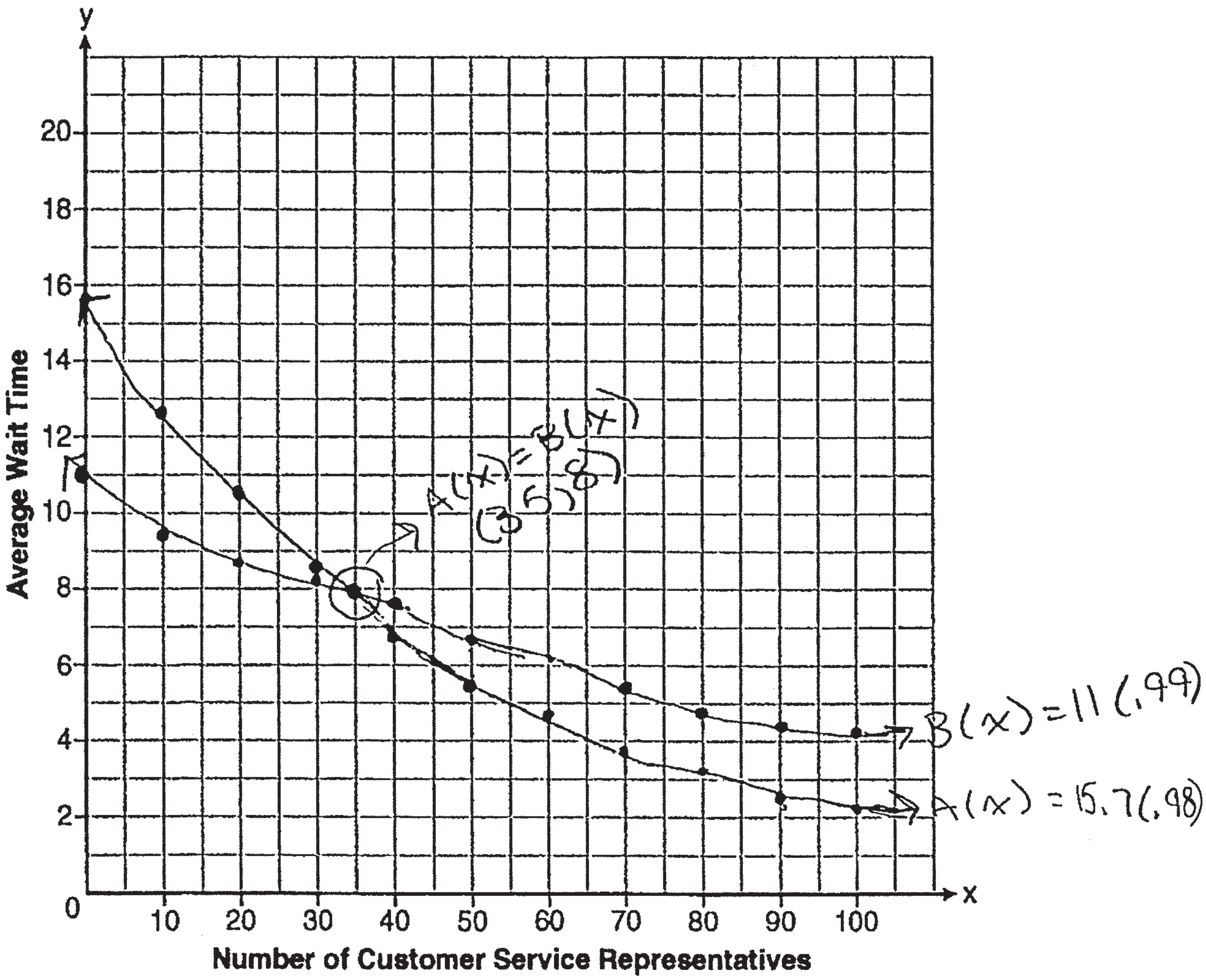
$1.9 \approx \boxed{2\text{ min}}$

For 100 customer Service Representatives The difference in average wait time is 2 minutes.

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 5: The student made a domain error in the graph.

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$15.7(.98)^x = 11(.99)^x$

$\boxed{x \approx 35 \text{ customer service reps}}$

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

$B(100) = 4.0264$

$A(100) = 2.0821$

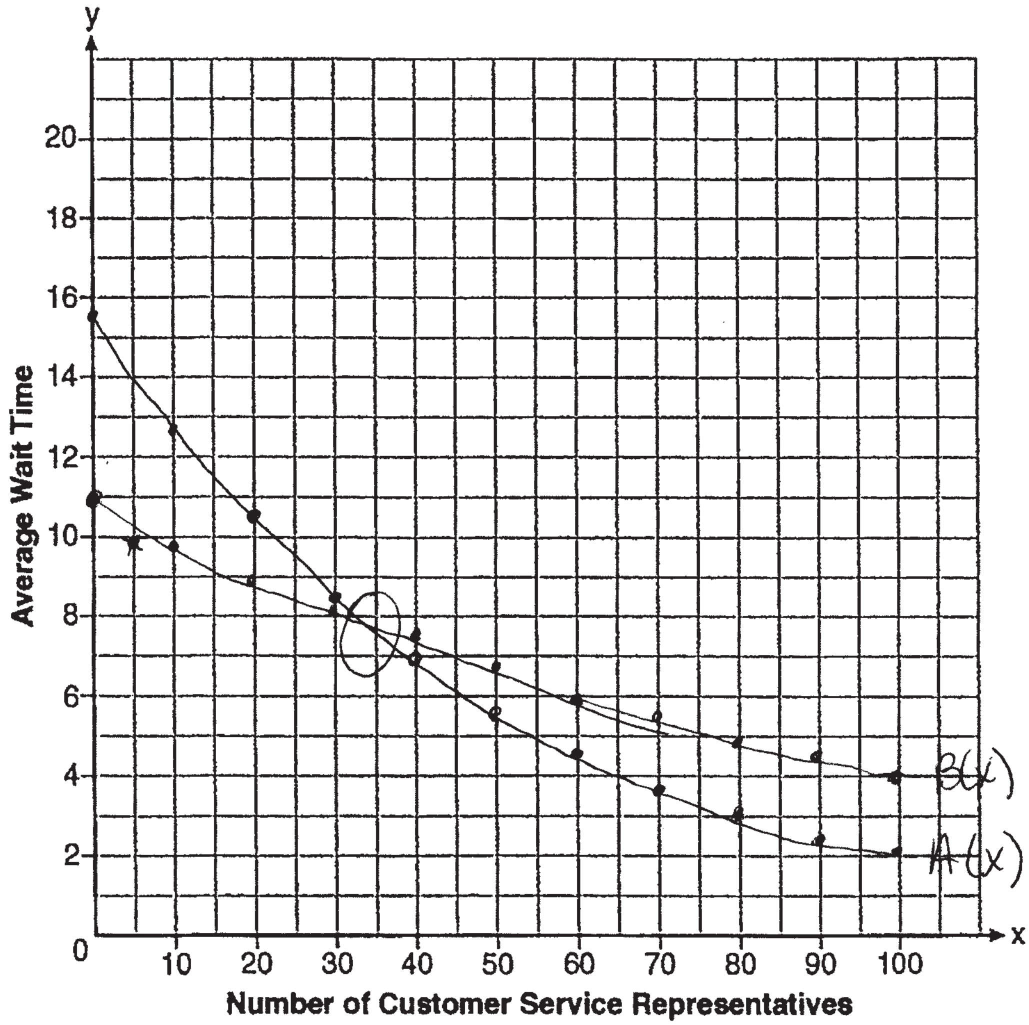
This value represents that with 100 customer service represented Plan B is 2 minutes slower than plan A.

$4.0264 - 2.0821 = 1.9443 \approx \boxed{2 \text{ min}}$

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \le x \le 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 5: The student gave an incomplete explanation.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

35

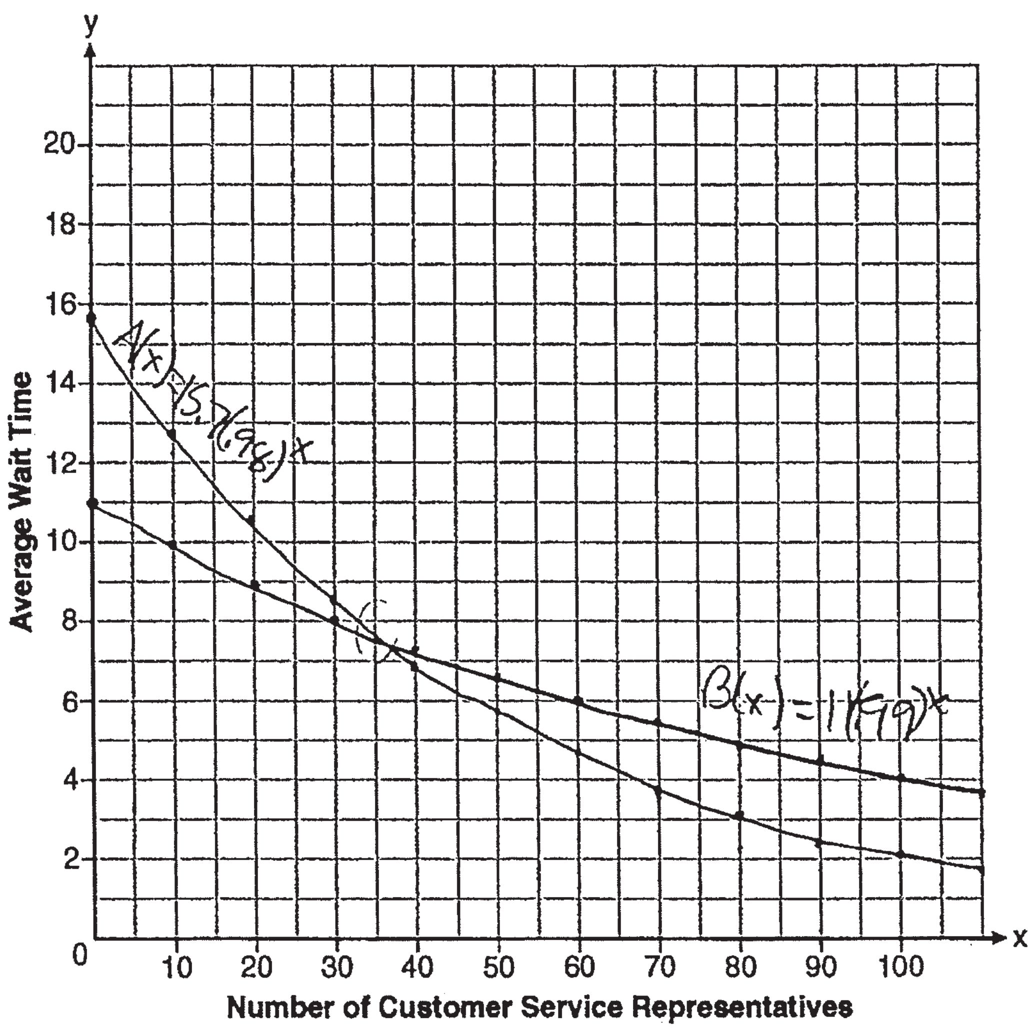
Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

4.0264 − 2.0812 = 1.9

2 min is the difference in wait time.

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \le x \le 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 4: The student made a domain error and wrote an incomplete explanation.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$x = 35$

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

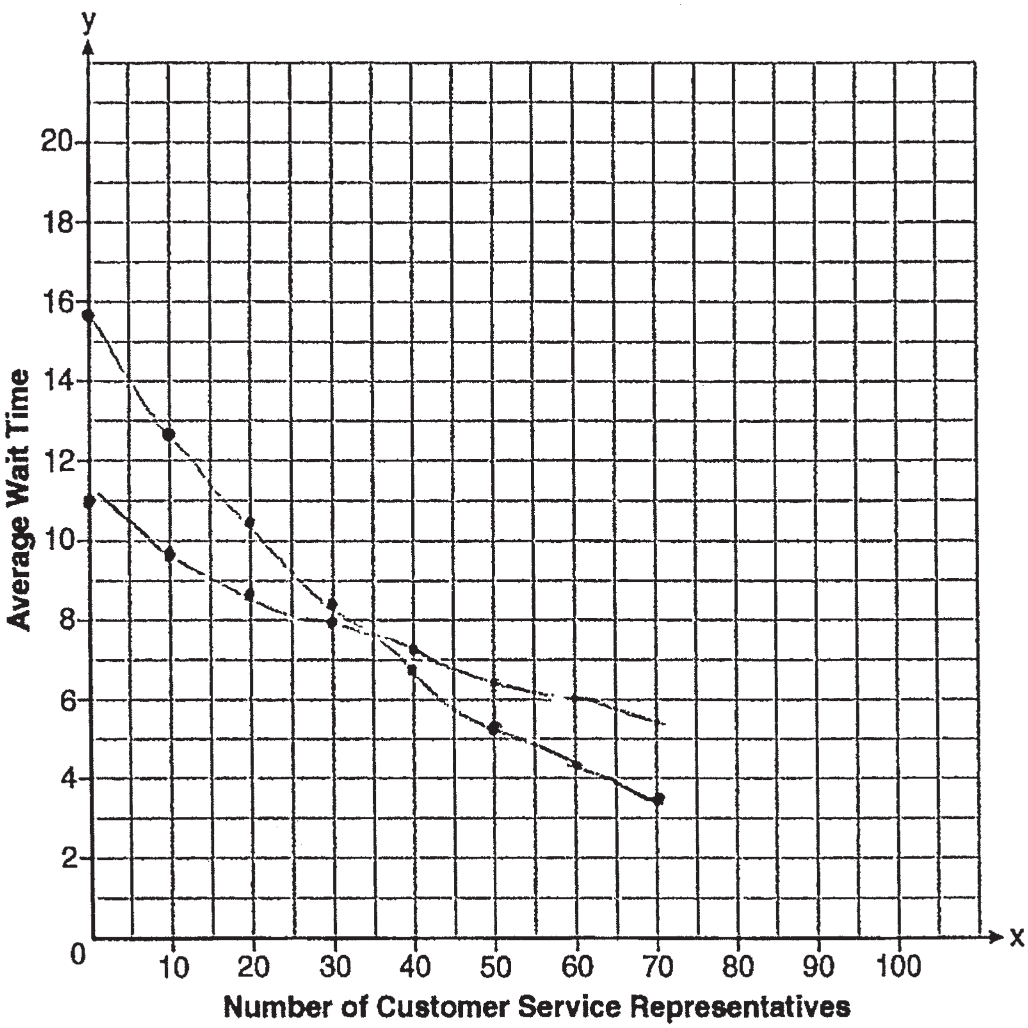
$4 - 2 = 2$

2 minutes of faster support time

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \le x \le 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 3: The student made a domain error, wrote no labels and an incomplete explanation.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

7.1 minutes

35 customers

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

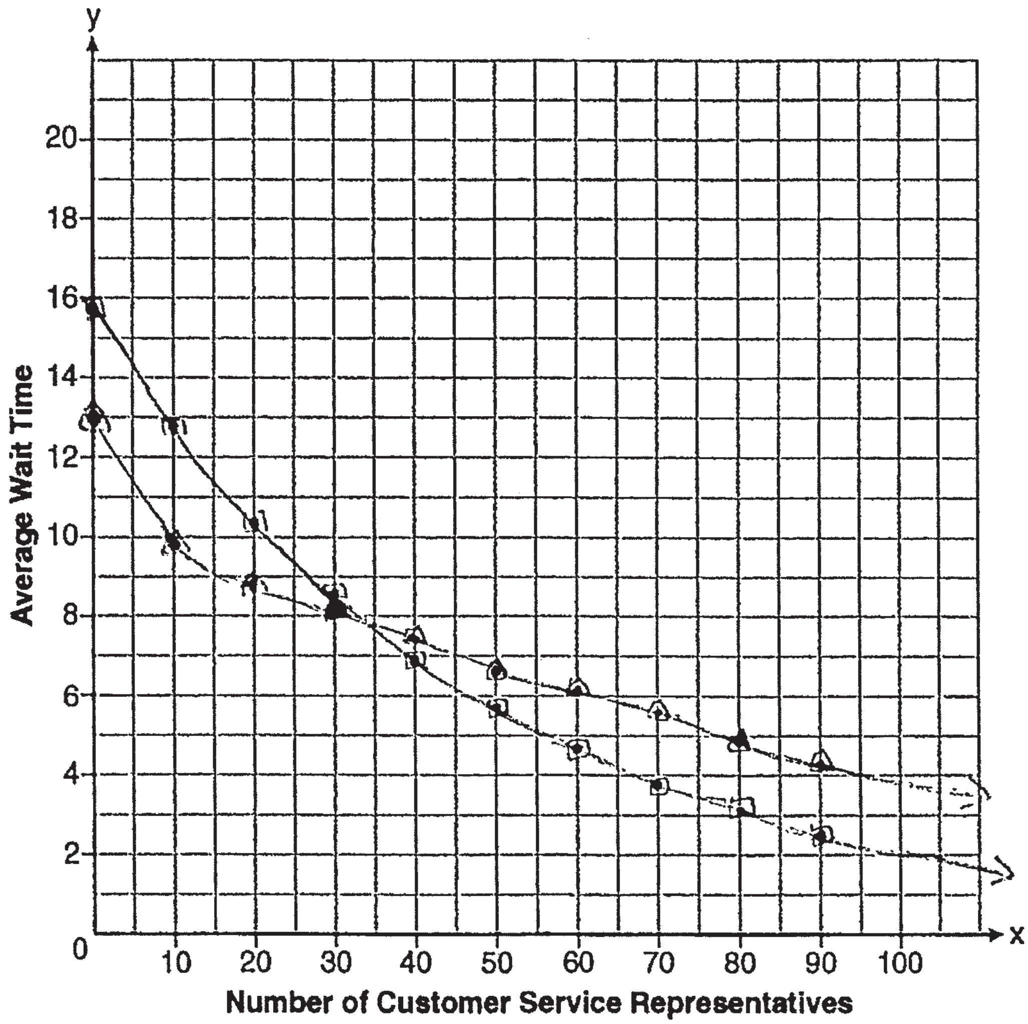
the difference in line between

the line 4-2 (2 minutes)

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \le x \le 100$ on the set of axes below.



Question 37 is continued on the next page.

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

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$15.7(0.98)^x = 11(0.99)^x$

$\boxed{x=35}$

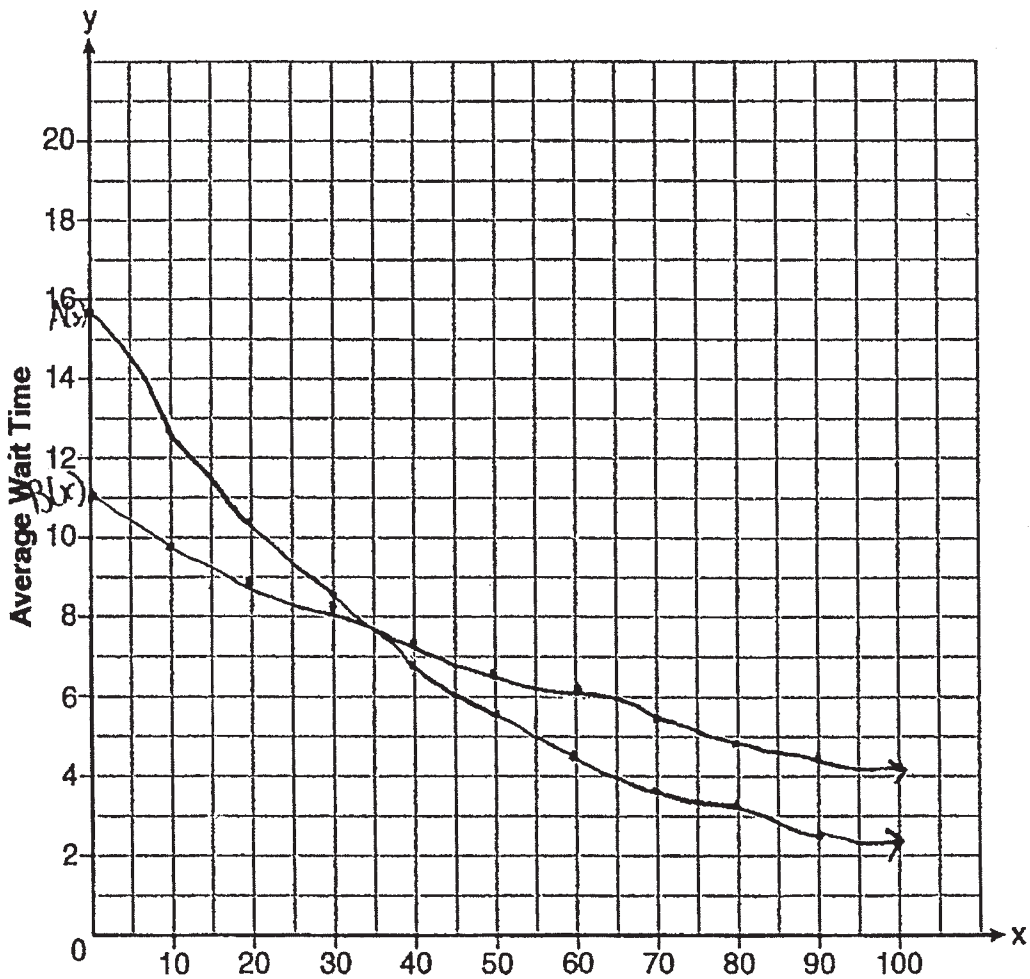
Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

$4.0264 - 2.0821 = 1.9443$

This represents the difference

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 2: The student made a domain error, a rounding error, and did not complete the third part.

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$15.7(.98)^{35.042595} = 11(.99)^{35.042595}$ $\boxed{x = 35.042595}$

$15.7(.49265049555) = 11(.703146177)$

$7.734612744 = 7.734612744$

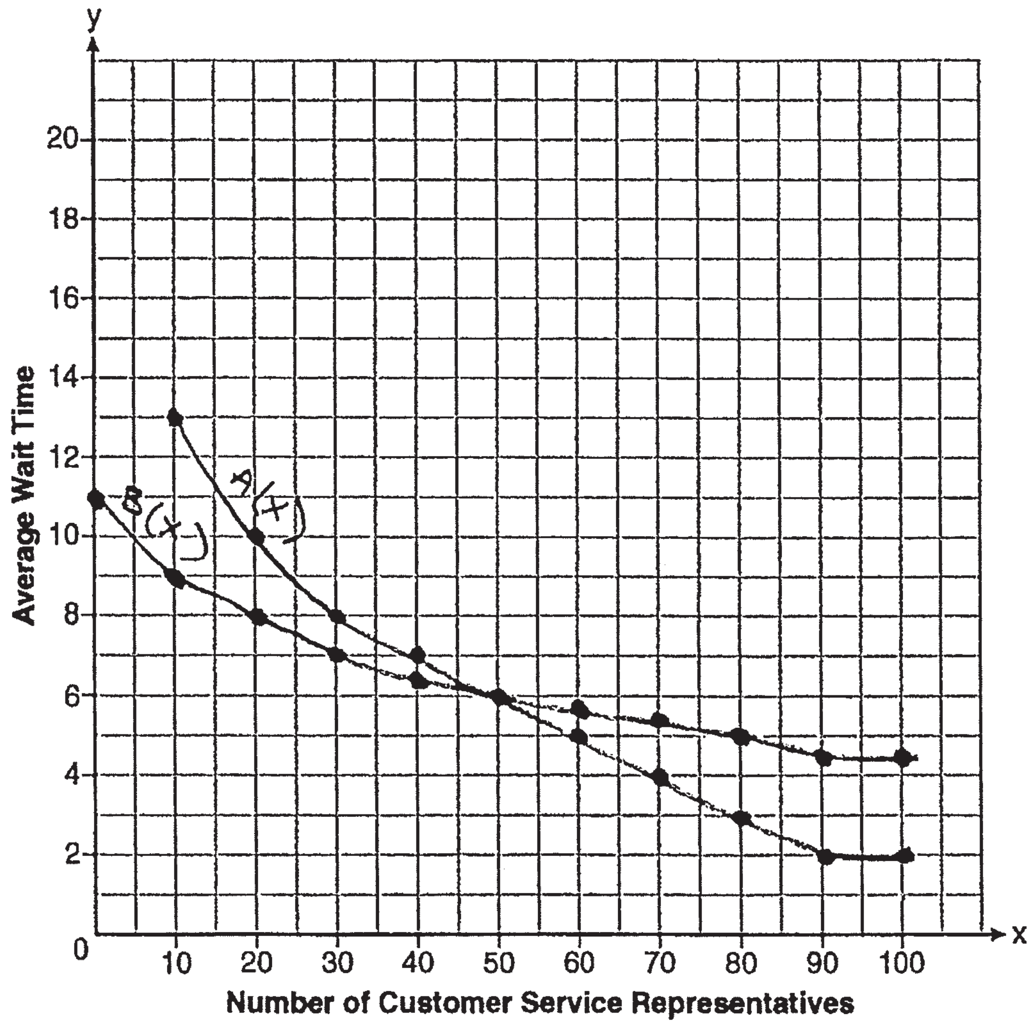
Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

$4.0264 - 2.0821 =$

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 1: The student calculated $B(100) - A(100)$, but showed no further correct work.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$15.7(.98)^x = 11(.99)^y$

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

$B = 11(.99)^{100}$

$B = 4.026355494$

$A = 15.7(.98)^{100}$

$A = 2.082127028$

$B(100) - A(100) =$

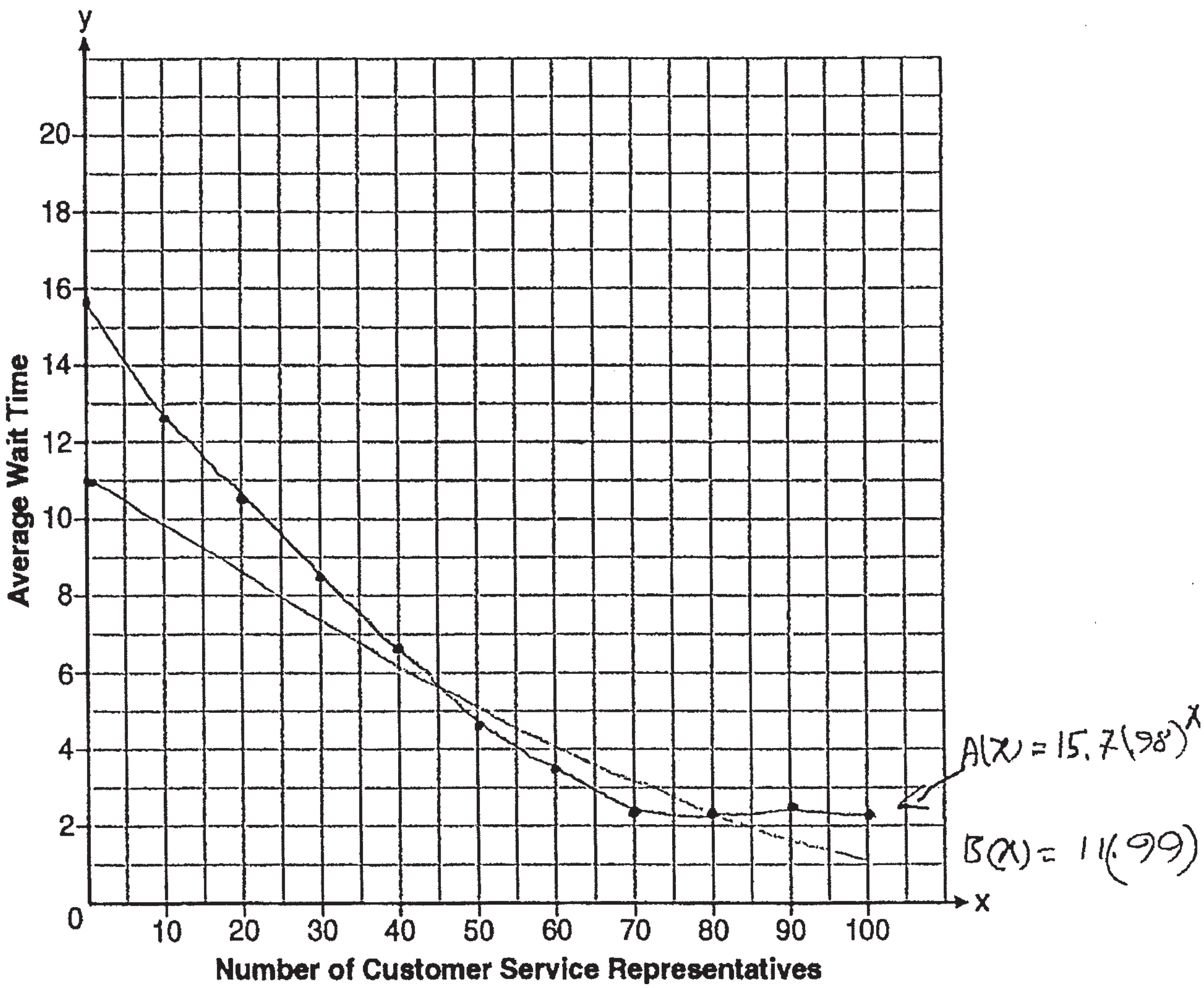
1.944228796

average wait time $\rightarrow$ 2 minutes

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

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

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$4.7x = .49747...$

$15.7(.98)^x = 11(.99)^x$

$15.7x \frac{100.98}{100.98} - 11x \frac{100.99}{100.98}$

$-11x \qquad -11x$

$x = .1058$

$x = 0$

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.