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

ALGEBRA II

Thursday, January 26, 2023 — 1:15 to 4:15 p.m., only

MODEL RESPONSE SET

Table of Contents

Question 25

25 Algebraically determine the zeros of the function below.

$$r(x) = 3x^3 + 12x^2 - 3x - 12$$

$0 = 3x^2(x+4) - 3(x+4)$

$0 = (3x^2 - 3)(x+4)$

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

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

$\boxed{x = \pm 1}$

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

Question 25

25 Algebraically determine the zeros of the function below.

$$r(x) = (3x^3 + 12x^2)(- 3x - 12)$$

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

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

$$(x+4)(3x^2-3) = 0$$

$(x+4) = 0$

$\boxed{x = -4}$

$3x^2 - 3 = 0$

$3x^2 = 3$

$x^2 = 1$

$\boxed{x = \pm\sqrt{1}}$

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

Question 25

25 Algebraically determine the zeros of the function below.

$$r(x) = (3x^3 + 12x^2) (- 3x - 12)$$

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

$$(3x^2-3)(x+4)=0$$

$$3x^2 \cancel{-3} = 0 \qquad x+\cancel{4}=0$$

$$\cancel{+3} \; +3 \qquad \cancel{-4} \; -4$$

$$\frac{\cancel{3}x^2}{\cancel{3}} = \frac{3}{3} \qquad \boxed{x=-4}$$

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

$$\boxed{x=1}$$

Score 1: The student did not indicate $x = -1$.

Question 25

25 Algebraically determine the zeros of the function below.

$$r(x) = 3x^3 + 12x^2 - 3x - 12$$

1

-1

-4

Score 1: The student did not show any work.

Question 25

25 Algebraically determine the zeros of the function below.

$$r(x) = 3x^3 + 12x^2 - 3x - 12 = 0$$

$+12$ $+12$

1, 0

-1, 0

-4, 0

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

$3x^3$

Score 0: The student did not algebraically determine the zeros, and attempted to write the zeros as coordinates.

Question 26

26 Given $a > 0$, solve the equation $a^{x+1} = \sqrt[3]{a^2}$ for x algebraically.

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

$$a^{3x+3} = a^2$$

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

$$3x = -1$$

$$\boxed{x = -\frac{1}{3}}$$

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

Question 26

26 Given $a > 0$, solve the equation $a^{x+1} = \sqrt[3]{a^2}$ for x algebraically.

$$a^{x+1} = \sqrt[3]{a^2}$$

$$a^{x+1} = a^{\frac{2}{3}}$$

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

$$-1$$

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

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

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

Question 26

26 Given $a > 0$, solve the equation $a^{x+1} = \sqrt[3]{a^2}$ for x algebraically.

$$a^{x+1} = a^{\frac{3}{2}}$$

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

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

Score 1: The student made an error by writing $a^{\frac{3}{2}}$.

Question 26

26 Given $a > 0$, solve the equation $a^{x+1} = \sqrt[3]{a^2}$ for x algebraically.

$$a^{x+1} = \sqrt[3]{a^2}$$

$$a^{x+1} = a^{2/3}$$

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

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

$$\boxed{x = -1\tfrac{2}{3}}$$

Score 1: The student made a computational error.

Question 26

26 Given $a > 0$, solve the equation $a^{x+1} = \sqrt[3]{a^2}$ for x algebraically.

$$a^{x+1} = \sqrt[3]{a^2}$$

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

$$2^{x+1} = \sqrt[3]{4}$$

$$\sqrt[x+1]{2^{x+1}} = \sqrt[x+1]{1.6}$$

$$\sqrt[x+1]{2} = \sqrt[x+1]{1.6}$$

$$\sqrt[x]{2} = \sqrt[x]{1.6}$$

$$x = 3.2$$

Score 0: The student showed no correct work.

Question 26

26 Given $a > 0$, solve the equation $a^{x+1} = \sqrt[3]{a^2}$ for x algebraically.

$$a^{x+1} = \sqrt[3]{a^2}$$

$$x + 1 = \frac{\frac{1}{3}}{a^2}$$

$$x + \cancel{1} = a^2 - \frac{1}{3}$$

$$-\cancel{1} \qquad -1$$

$$x = a^2 - \frac{1}{3}$$

$$x = a^2 - \frac{1}{3}$$

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

Question 27

27 Given $P(A) = \frac{1}{3}$ and $P(B) = \frac{5}{12}$, where A and B are independent events, determine $P(A \cap B)$.

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

$$P(A \cap B) = \left(\frac{1}{3} \cdot \frac{5}{12}\right)$$

$$= \boxed{\frac{5}{36}}$$

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

Question 27

27 Given $P(A) = \frac{1}{3}$ and $P(B) = \frac{5}{12}$, where A and B are independent events, determine $P(A \cap B)$.

$$\frac{1}{3} \times \frac{5}{12} = \boxed{\frac{5}{36}}$$

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

Question 27

27 Given $P(A) = \frac{1}{3}$ and $P(B) = \frac{5}{12}$, where A and B are independent events, determine $P(A \cap B)$.

$$\frac{1}{3} \cdot \frac{5}{12} = \frac{5}{36}$$

$$= \boxed{14\%}$$

Score 1: The student received a deduction for rounding the answer to 14%.

Question 27

27 Given $P(A) = \frac{1}{3}$ and $P(B) = \frac{5}{12}$, where A and B are independent events, determine $P(A \cap B)$.

$$P(A \cap B) = \frac{P(B) \cdot P(A)}{P(B)}$$

$$\frac{\frac{5}{12} \cdot \frac{1}{3}}{\frac{5}{4}}$$

$$P(A \cap B) = \frac{1}{5}$$

Score 0: The student made multiple errors.

Question 27

27 Given $P(A) = \frac{1}{3}$ and $P(B) = \frac{5}{12}$, where A and B are independent events, determine $P(A \cap B)$.

$$(Pa) + (PB) = P(A + B)$$

$$\frac{1}{3} + \frac{5}{12} = P\left(\frac{1}{3}\right)\left(\frac{5}{12}\right)$$

$$.333 + .416 = .138$$

Score 0: The student made multiple errors.

Question 28

28 The scores on a collegiate mathematics readiness assessment are approximately normally distributed with a mean of 680 and a standard deviation of 120.

Determine the percentage of scores between 690 and 900, to the *nearest percent*.

lower = 690
upper = 900
mean = 680
sd = 120

~~43~~

43%

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

Question 28

28 The scores on a collegiate mathematics readiness assessment are approximately normally distributed with a mean of 680 and a standard deviation of 120.

Determine the percentage of scores between 690 and 900, to the *nearest percent*.

2nd | Vars | normalcdf(690,900,680,120)

43%

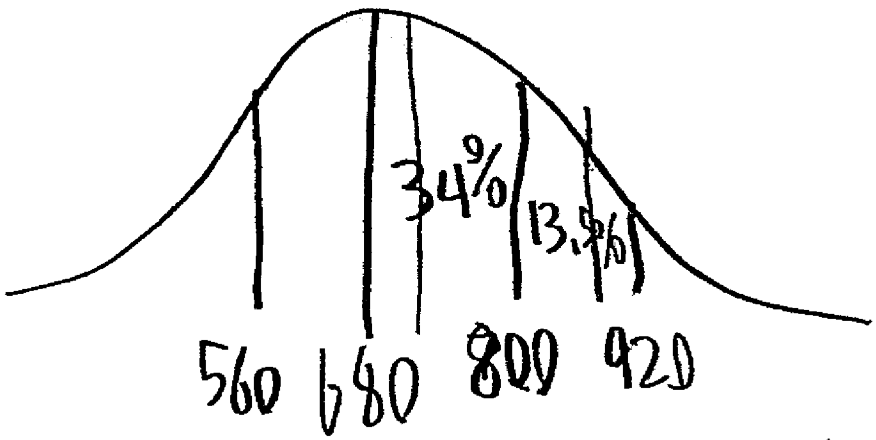
Score 2: The student gave a complete and correct response.

Question 28

28 The scores on a collegiate mathematics readiness assessment are approximately normally distributed with a mean of 680 and a standard deviation of 120.

Determine the percentage of scores between 690 and 900, to the *nearest percent*.

$(.34)\cdot\frac{11}{12}+\frac{5}{6}\cdot(.135)$



$(.34\cdot(\frac{11}{12}))+(.135\cdot(\frac{5}{6}))=.42416$

42%

Score 1: The student used estimates to get 42%.

Question 28

28 The scores on a collegiate mathematics readiness assessment are approximately normally distributed with a mean of 680 and a standard deviation of 120.

Determine the percentage of scores between 690 and 900, to the *nearest percent*.

$\bar{x} = 680$

$SD = 120$

lower $= 690$

upper $= 900$

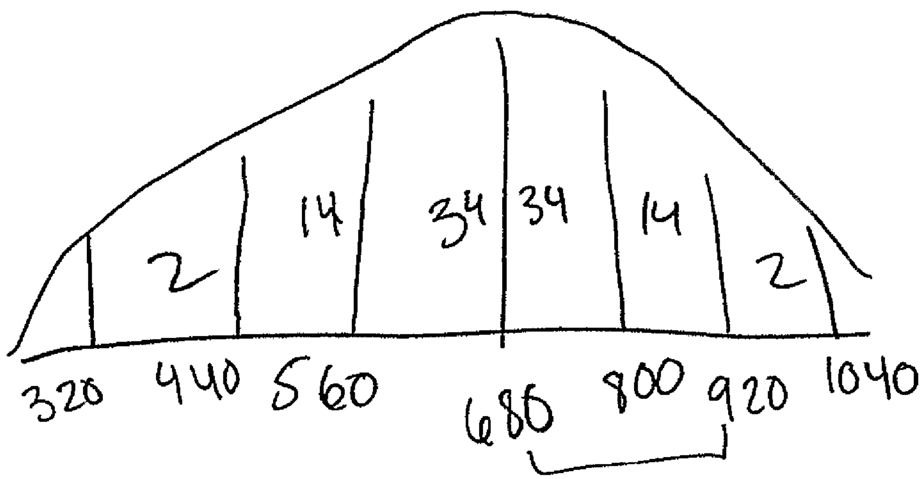
$\boxed{43.3\%}$

Score 1: The student made a rounding error.

Question 28

28 The scores on a collegiate mathematics readiness assessment are approximately normally distributed with a mean of 680 and a standard deviation of 120.

Determine the percentage of scores between 690 and 900, to the *nearest percent*.



$\boxed{2\%}$

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

Question 29

29 Consider the data in the table below.

x	1	2	3	4	5	6
y	3.9	6	11	18.1	28	40.3

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

Stat > Edit > calc > ExpReg

$y = a*b^x$

$a = 2.458522514$
$b = 1.615900017$

$y = (2.459)(1.616)^x$

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

Question 29

29 Consider the data in the table below.

x	1	2	3	4	5	6
y	3.9	6	11	18.1	28	40.3

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

$y = a * b^x$

$a = 2.458522514$

$b = 1.6159 0017$

$r^2 = .9945307941$

$r = .9972616478$

$y = a * b^x$

$a = 2.459$

$b = 1.616$

$r^2 = .995$

$r = .997$

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

Question 29

29 Consider the data in the table below.

x	1	2	3	4	5	6
y	3.9	6	11	18.1	28	40.3

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

$y = ab^x$

$y = 2.46(1.62)^x$

Score 1: The student made a rounding error.

Question 29

29 Consider the data in the table below.

x	1	2	3	4	5	6
y	3.9	6	11	18.1	28	40.3

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

$$y = 2.439(1.619)^x$$

Score 1: The student made a transcription error entering the data.

Question 29

29 Consider the data in the table below.

x	1	2	3	4	5	6
y	3.9	6	11	18.1	28	40.3

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

$y = ab^x$

$y = ax + b$

$y = 7.289x - 7.627$

Score 1: The student found a correct linear regression function.

Question 29

29 Consider the data in the table below.

x	1	2	3	4	5	6
y	3.9	6	11	18.1	28	40.3

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

$y = ab^x$

$y = 2.715 \cdot 1.579^x$

$y = 4.287^x$

Score 0: The student made multiple errors.

30 Write the expression $A(x) \bullet B(x) - 3C(x)$ as a polynomial in standard form.

$$A(x) = x^3 + 2x - 1$$
$$B(x) = x^2 + 7$$
$$C(x) = x^4 - 5x$$

	x^3	$2x$	-1
x^2	x^5	$2x^3$	$-x^2$
7	$7x^3$	$14x$	-7

$(x^3+2x-1)(x^2+7)-3(x^4-5x)$

$x^5+9x^3-x^2+14x-7-3x^4+15x$

$x^5-3x^4+9x^3-x^2+29x-7$

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

Question 30

30 Write the expression $A(x) \bullet B(x) - 3C(x)$ as a polynomial in standard form.

$$A(x) = x^3 + 2x - 1$$
$$B(x) = x^2 + 7$$
$$C(x) = x^4 - 5x$$

$(x^2+7)(x^3+2x-1)$

$x^5+2x^3-x^2+7x^3+14x-7$

$x^5+9x^3-x^2+14x-7$

$3(x^4-5x)$

$3x^4-15x$

$x^5+9x^3-x^2+14x-7$

$-\quad 3x^4-15x$

$\boxed{x^5-3x^4+9x^3-x^2+29x-7}$

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

Question 30

30 Write the expression $A(x) \bullet B(x) - 3C(x)$ as a polynomial in standard form.

$$A(x) = x^3 + 2x - 1$$
$$B(x) = x^2 + 7$$
$$C(x) = x^4 - 5x$$

$(x^3+2x-1)(x^2+7) - 3(x^4-5x)$

$x^5+7x^3+2x^3+14x-x^2-7$

$x^5+9x^3-x^2+14x-7-3x^4-15x$

$\boxed{x^5-3x^4+9x^3-x^2-x-7}$

Score 1: The student multiplied $-3C(x)$ incorrectly.

Question 30

30 Write the expression $A(x) \bullet B(x) - 3C(x)$ as a polynomial in standard form.

$$A(x) = x^3 + 2x - 1$$
$$B(x) = x^2 + 7$$
$$C(x) = x^4 - 5x$$

$ax + bx$

$$(x^3 + 2x - 1)(x^2 + 7) - 3(x^4 - 5x)$$

$$x^5 + 7x^3 + 2x^3 + 14x - x^2 - 7$$

$$x^5 + 9x^3 - x^2 + 14x - 7 - 3x^4 + 15x$$

Score 1: The student did not write the expression in standard form.

Question 30

30 Write the expression $A(x) \bullet B(x) - 3C(x)$ as a polynomial in standard form.

$$A(x) = x^3 + 2x - 1$$
$$B(x) = x^2 + 7$$
$$C(x) = x^4 - 5x$$

$(x^3 + 2x - 1) \cdot (x^2 + 7)) - 3(x^4 - 5x)$

$(x^5 + 2x^3 - x^2 + 7x^3 + 14x - 7)$

$(x^5 + 9x^3 - x^2 - 7)) - 3x^4 - 15x$

$x^5 + -3x^4 + 9x^3 - x^2 - 15x - 7$

Score 0: The student made multiple errors.

Question 30

30 Write the expression $A(x) \bullet B(x) - 3C(x)$ as a polynomial in standard form.

$$A(x) = x^3 + 2x - 1$$
$$B(x) = x^2 + 7$$
$$C(x) = x^4 - 5x$$

$(x^3+2x-1)(x^2+7)-3(x^4-5x)$

	x^3	$2x$	-1
x^2	x^5	$2x^3$	$-x^2$
7	$7x^3$	$14x$	-7

$x^5+9x^3-x^2+14x-7$

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

Question 31

31 Over the set of integers, completely factor $x^4 - 5x^2 + 4$.

$$X^4 - 5x^2 + 4$$

$$X^4 - 4x^2 - x^2 + 4$$

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

$$(X^2 - 1)(X^2 - 4)$$

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

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

Question 31

31 Over the set of integers, completely factor $x^4 - 5x^2 + 4$.

x^4-5x^2+4

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

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

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

Question 31

31 Over the set of integers, completely factor $x^4 - 5x^2 + 4$.

$x^4 - 5x^2 + 4$

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

Score 1: The student did not factor completely.

Question 31

31 Over the set of integers, completely factor $x^4 - 5x^2 + 4$.

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

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

Score 1: The student made one factoring error.

Question 31

31 Over the set of integers, completely factor $x^4 - 5x^2 + 4$.

$\cancel{(x+3)}$. $(x+2)(x+1)(x-2)(x-1)$

plugged into calculator

Score 1: The student did not show enough correct work to receive full credit.

Question 31

31 Over the set of integers, completely factor $x^4 - 5x^2 + 4$.

$$x^4 - 5x^2 + 4$$

$a = 1$
$b = -5$
$c = 4$

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

$$\frac{5 \pm 3}{2}$$

$$\frac{5+3}{2} = 4$$

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

$$\boxed{\{1, 4\}}$$

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

Question 32

32 Natalia's teacher has given her the following information about angle θ.

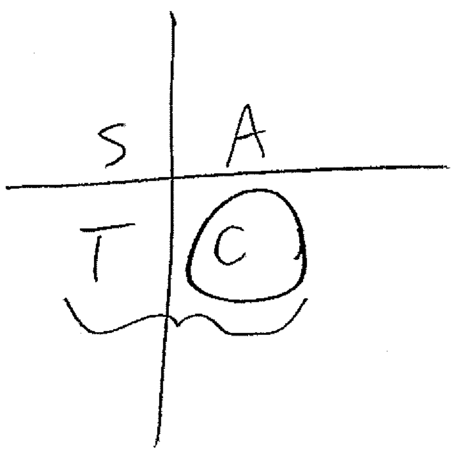
- $\overset{180}{\pi} < \theta < \overset{360}{2\pi}$
- $\cos\theta = \frac{\sqrt{3}}{4}$ → is positive

Explain how Natalia can determine if the value of tan θ is positive or negative.

$\tan = \frac{O}{A}$

$\cos = \frac{A}{H}$

tan θ is negative because cos θ is positive which lands it in the Fourth quadrant. only cos θ can be positive because the angle is between 180° and 360°.



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

Question 32

32 Natalia's teacher has given her the following information about angle θ.

180 360

- $\pi < \theta < 2\pi$
- $\cos\theta = \frac{\sqrt{3}}{4}$

Explain how Natalia can determine if the value of tan θ is positive or negative.

Depending on what quadrant cos θ is. Since cos θ = $\frac{\sqrt{3}}{4}$ and in positive it means its either in quadrant I or IV. However π<θ<2π means 180<θ<360 therefor it can't be quadrant I, becaus quad I is 90°. Than θ is negative because the given information indicates quad IV and tan is only positive in quad III.

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

Question 32

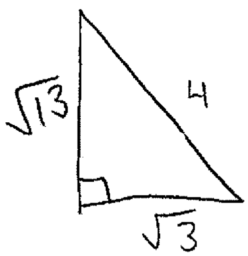
32 Natalia's teacher has given her the following information about angle θ.

- $\pi < \theta < 2\pi$
- $\cos \theta = \dfrac{\sqrt{3}}{4}$

↓
positive in cos

Explain how Natalia can determine if the value of tan θ is positive or negative.

SohCahToa



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

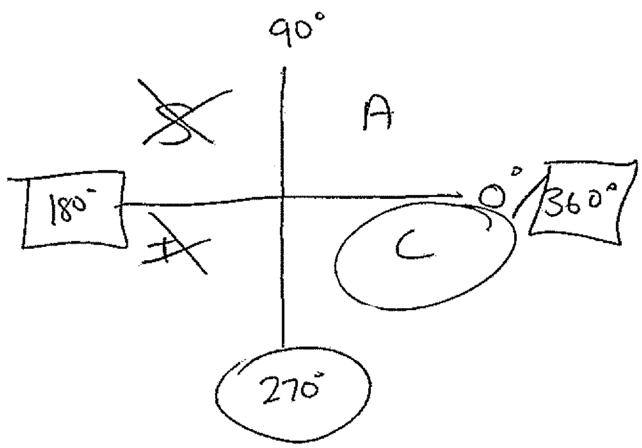
$\sqrt{3}^2 + b^2 = 4^2$

$3 + b^2 = 16$

$b^2 = 13$

$b = \sqrt{13}$

$\text{Tan}\,\theta = -\dfrac{\sqrt{13}}{\sqrt{3}}$



$\pi = 180$

$2\pi = 360$

$180° < \theta < 360°$

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

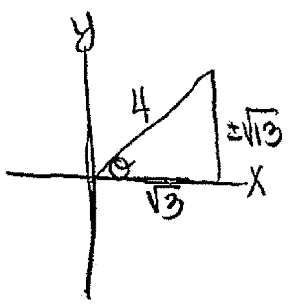
Question 32

32 Natalia's teacher has given her the following information about angle θ.

SohCah Toa

- $\pi < \theta < 2\pi$
- $\cos\theta = \frac{\sqrt{3}}{4}$ $\frac{\text{adj}}{\text{hyp}}$

Explain how Natalia can determine if the value of tan θ is positive or negative.



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

$(\sqrt{3})^2+b^2=4^2$

$3+b^2=16$

$-3 \quad\quad -3$

$\sqrt{b^2}=\sqrt{13}$

$b=\pm\sqrt{13}$

$\tan\theta = \frac{\sqrt{13}\cdot\sqrt{3}}{\sqrt{3}\cdot\sqrt{3}}$ $\frac{\sqrt{39}}{3}$

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

Question 33

33 Solve the equation $\sqrt{49 - 10x} + 5 = 2x$ algebraically.

$$(\sqrt{49-10x})^2 = (2x-5)^2$$
$$49-10x = 4x^2-20x+25$$
$$0 = 4x^2-10x-24$$
$$0 = 2(2x^2-5x-12)$$
$$0 = 2(2x+3)(x-4)$$
$$0 \neq 2 \quad 0 = 2x+3 \quad 0 = x-4$$
$$x = -\frac{3}{2} \quad x = 4$$
reject

$$\{4\}$$

check

$$\sqrt{49-10(4)} + 5 = 2(4)$$
$$\sqrt{9} + 5 = 8$$
$$3 + 5 = 8$$
$$8 = 8$$

$$\sqrt{49 \cdot 10(-\frac{3}{2})} + 5 = 2(-\frac{3}{2})$$
$$\sqrt{64} + 5 = -3$$
$$8 + 5 = -3$$
$$13 \neq -3$$

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

33 Solve the equation $\sqrt{49-10x}+5=2x$ algebraically.

$-5 \quad -5$

$(\sqrt{49-10x})^2 = (2x-5)^2 (2x-5)$

$49-10x = 4x^2-20x+25$
$+10x$

$49 = 4x^2-10x+25$
$-25 \qquad -25$

$24 = 4x^2-10x$
-24

$4x^2-10x-24$

$\sqrt{49-10(4)}+5 = 2(4)$
$8 = 8$

$\dfrac{10+\sqrt{(-10)^2-4(4)(-24)}}{2(4)} = 4$

$\dfrac{10-\sqrt{(-10)^2-4(4)(-24)}}{2(4)} = -\dfrac{3}{2}$

$\sqrt{49-10(-\frac{3}{2})}+5 = 2(-\frac{3}{2})$

$13 \neq -3$

Score 3: The student did not clearly reject $-\frac{3}{2}$.

Question 33

33 Solve the equation $\sqrt{49 - 10x} + 5 = 2x$ algebraically.

$$\sqrt{49-10x} + 5 = 2x$$
$$-5 \quad -5$$
$$\sqrt{49-10x}^2 = (2x-5)^2$$

	$2x$	-5
$2x$	$4x^2$	$-10x$
-5	$-10x$	25

$$49-10x = (2x-5)^2$$
$$49-10x = 4x^2-20x+25$$
$$-49+10x \qquad +10x \quad -49$$
$$0 = 4x^2-10x-24$$

$$x = \frac{+10 \pm \sqrt{100-4(4)(-24)}}{8}$$

$$x = \frac{10 \pm 22}{8}$$

$$x = \frac{32}{8} = 4$$

$$x = \frac{-12}{8} = -1.5$$

check:

$$\sqrt{49-10(4)} + 5 = 2(4)$$
$$\sqrt{49-40} + 5 = 8$$
$$\sqrt{9} + 5 = 8$$
$$3 + 5 = 8$$
✓

$$\sqrt{49-10(-1.5)} + 5 = -3$$
$$\sqrt{64} + 5 = -3$$
$$-8 + 5 = -3$$
✓

Score 3: The student made a computational error evaluating $\sqrt{64}$.

Question 33

33 Solve the equation $\sqrt{49 - 10x} + 5 = 2x$ algebraically.

$(2x-5)(2x-5)$

$4x^2 - 10x - 10x + 10$

$4x^2 - 20x + 10$

$\sqrt{49-10x} \underset{-5}{+5} = 2x - 5$

$\left(\sqrt{49-10x}\right)^2 = (2x-5)^2$

$49 - 10x = 4x^2 - 20x + 10$

$-49 + 10x$

$4x^2 - 10x - 39$

$a \quad b \quad c$

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

$= \dfrac{10 \pm \sqrt{100 - 4(4)(-39)}}{8}$

$\dfrac{10 \pm \sqrt{724}}{8}$

4.61

-2.11

Score 2: The student made two or more computational errors.

Question 33

33 Solve the equation $\sqrt{49-10x}+5=2x$ algebraically.

$$\sqrt{49-10x}+5=2x$$
$$-5 \quad -5$$
$$\left(\sqrt{49-10x}\right)^2=(2x-5)^2$$
$$49-10x=(2x-5)(2x-5)$$
$$49-10x=4x^2-10x-10x+25$$
$$49-10x=4x^2-20x+25$$
$$-49+10x \qquad -49+10x$$
$$0=4x^2-10x-24$$
$$0=(2x+4)(2x-6)$$

$$0=2x+4 \qquad 0=2x-6$$
$$-4 \quad -4 \qquad +6 \quad +6$$
$$\frac{-4}{2}=\frac{2x}{2} \qquad \frac{6}{2}=\frac{2x}{2}$$
$$-2=x \qquad 3=x$$

Score 2: The student made a factoring error and did not check for extraneous roots.

Question 33

33 Solve the equation $\sqrt{49 - 10x} + 5 = 2x$ algebraically.

$(\sqrt{49-10x})^2 = (2x-5)^2$

$(2x-5)(2x-5)$

$4x^2 - 10x - 10x + 25$

$4x^2 - 20x + 25$

$49 - 10x = 4x^2 - 20x + 25$

$-49 + 10x \qquad\qquad +10x - 49$

$4x^2 - 10x - 24 = 0$

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

Score 1: The student wrote a correct quadratic equation in standard form.

Question 33

33 Solve the equation $\sqrt{49 - 10x} + 5 = 2x$ algebraically.

$$\sqrt{-10x+49} = 2x-5$$

$$x = 4$$

Score 1: The student received one credit for $x = 4$.

Question 33

33 Solve the equation $\sqrt{49 - 10x} + 5 = 2x$ algebraically.

$$\sqrt{49-10x}+5=2x$$
$$+10x \qquad +10x$$

$$\sqrt{49}+5=12x$$

$$7+5=12x$$

$$\frac{12}{12}=\frac{12x}{12}$$

$$1=x$$

$$\boxed{x=1}$$

Score 0: The student made multiple conceptual errors.

Question 33

33 Solve the equation $\sqrt{49 - 10x} + 5 = 2x$ algebraically.

$\sqrt{49-10x}^2 = (2x-5)^2$

$49-10x = 4x^2-20x+25$

$24-10x = 4x^2-20x$

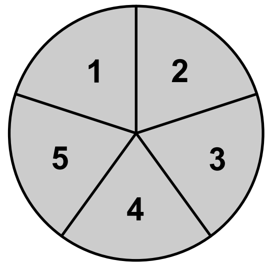
$24 = 4x^2-10x$

$24 = 2x(2x-5)$

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

Question 34

34 Joette is playing a carnival game. To win a prize, one has to correctly guess which of five equally sized regions a spinner will land on, as shown in the diagram below.



She complains that the game is unfair because her favorite number, 2, has only been spun once in ten times she played the game.

State the proportion of 2's that were spun.

$1/10$

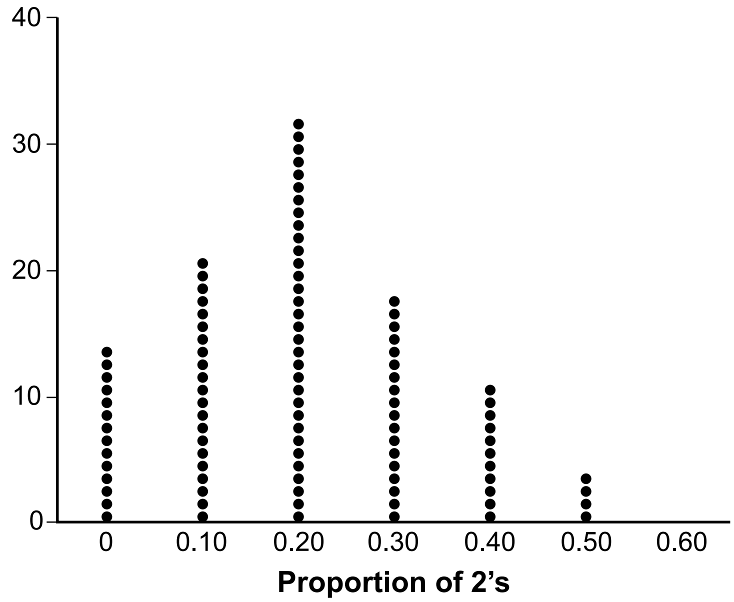
State the theoretical probability of spinning a 2.

$1/5$

Question 34 is continued on the next page.

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

The simulation output below shows the results of simulating ten spins of a fair spinner, repeated 100 times.

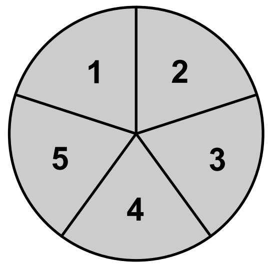


Does the output indicate that the carnival game was unfair? Explain your answer.

No, because .10 occurs 21% of the time which is not unusal.

Question 34

34 Joette is playing a carnival game. To win a prize, one has to correctly guess which of five equally sized regions a spinner will land on, as shown in the diagram below.



She complains that the game is unfair because her favorite number, 2, has only been spun once in ten times she played the game.

State the proportion of 2's that were spun.

$\frac{1}{10}$

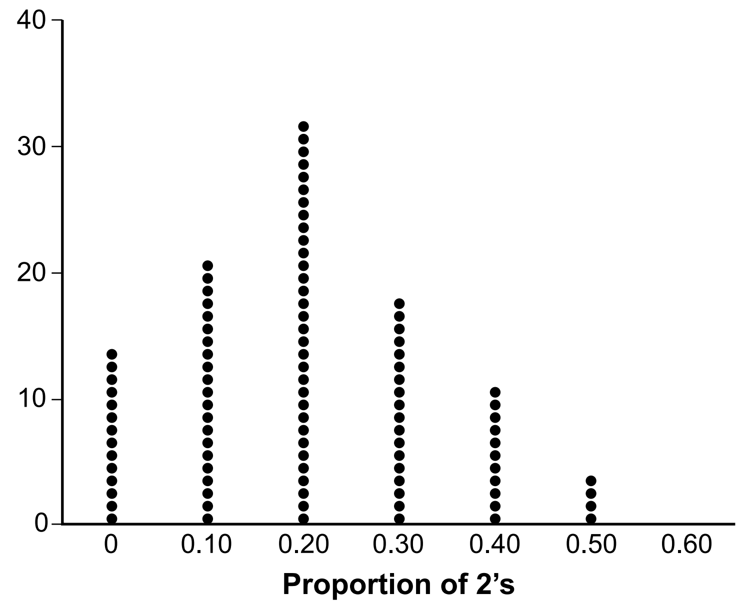
State the theoretical probability of spinning a 2.

$\frac{1}{5}$

Question 34 is continued on the next page.

Score 3: The student wrote an incomplete explanation.

The simulation output below shows the results of simulating ten spins of a fair spinner, repeated 100 times.

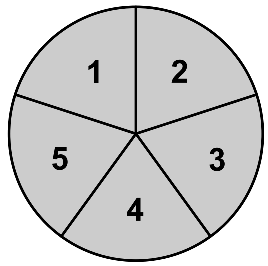


Does the output indicate that the carnival game was unfair? Explain your answer.

No, it happened alot so it is not unusual.

Question 34

34 Joette is playing a carnival game. To win a prize, one has to correctly guess which of five equally sized regions a spinner will land on, as shown in the diagram below.



She complains that the game is unfair because her favorite number, 2, has only been spun once in ten times she played the game.

State the proportion of 2's that were spun.

$\frac{1}{10}$ is the proportion.

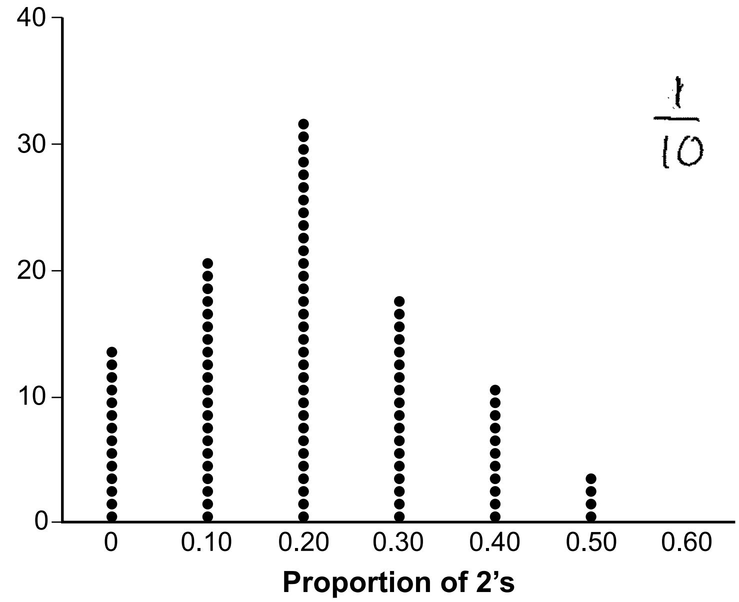
State the theoretical probability of spinning a 2.

There is a $\frac{1}{5}$ chance the number 2 will be spun.

Question 34 is continued on the next page.

Score 2: The student received no credit for the explanation.

The simulation output below shows the results of simulating ten spins of a fair spinner, repeated 100 times.



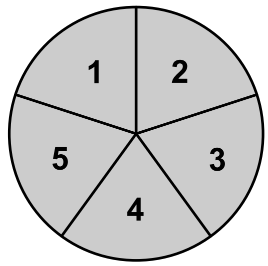
$\frac{1}{10} \neq \frac{1}{5}$

Does the output indicate that the carnival game was unfair? Explain your answer.

No, it indicates that it was fair because there were 100 tries and it is not dependent on anything.

Question 34

34 Joette is playing a carnival game. To win a prize, one has to correctly guess which of five equally sized regions a spinner will land on, as shown in the diagram below.



She complains that the game is unfair because her favorite number, 2, has only been spun once in ten times she played the game.

State the proportion of 2's that were spun.

$\frac{1}{10}$

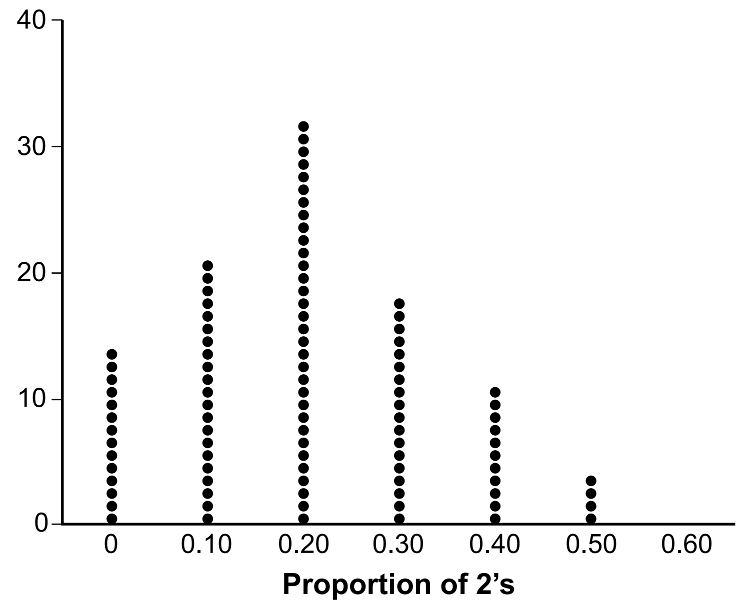
State the theoretical probability of spinning a 2.

The theoretical probability of spinning a 2 is $1/5$.

Question 34 is continued on the next page.

Score 2: The student received no credit for the explanation.

The simulation output below shows the results of simulating ten spins of a fair spinner, repeated 100 times.

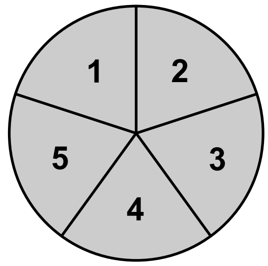


Does the output indicate that the carnival game was unfair? Explain your answer.

The output does indicate that the carnival game was unfair because there is only 0.20 chance to land on a 2, which is unlikely.

Question 34

34 Joette is playing a carnival game. To win a prize, one has to correctly guess which of five equally sized regions a spinner will land on, as shown in the diagram below.



She complains that the game is unfair because her favorite number, 2, has only been spun once in ten times she played the game.

State the proportion of 2's that were spun.

$\frac{1}{10}$

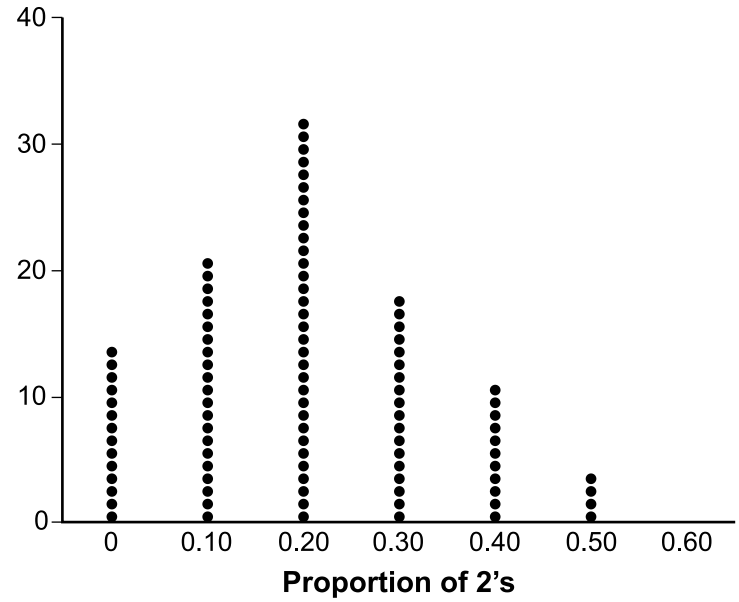
State the theoretical probability of spinning a 2.

once in every 10 turns
you will spin a 2

Question 34 is continued on the next page.

Score 1: The student received one credit for $\frac{1}{10}$.

The simulation output below shows the results of simulating ten spins of a fair spinner, repeated 100 times.

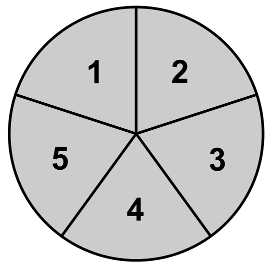


Does the output indicate that the carnival game was unfair? Explain your answer.

yes, because the number of 2's spun is not in a constant ratio.

Question 34

34 Joette is playing a carnival game. To win a prize, one has to correctly guess which of five equally sized regions a spinner will land on, as shown in the diagram below.



She complains that the game is unfair because her favorite number, 2, has only been spun once in ten times she played the game.

State the proportion of 2's that were spun.

$\frac{1}{5}$

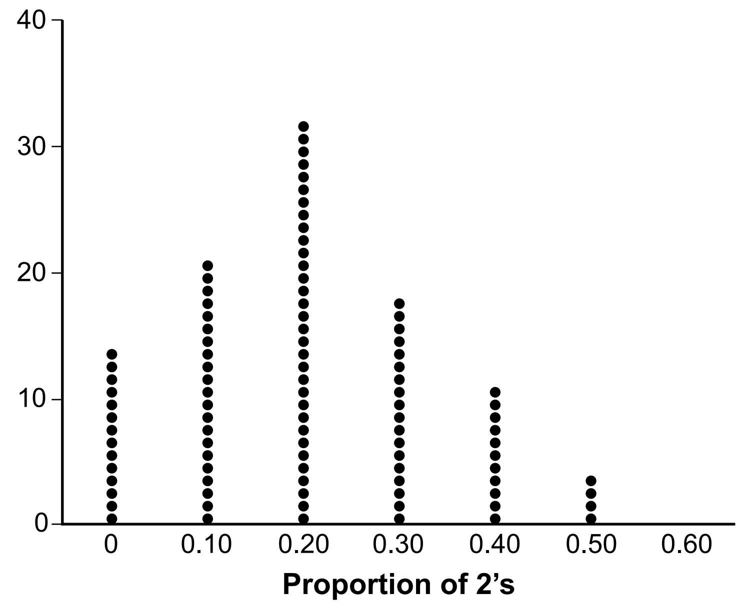
State the theoretical probability of spinning a 2.

$\frac{1}{2}$

Question 34 is continued on the next page.

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

The simulation output below shows the results of simulating ten spins of a fair spinner, repeated 100 times.

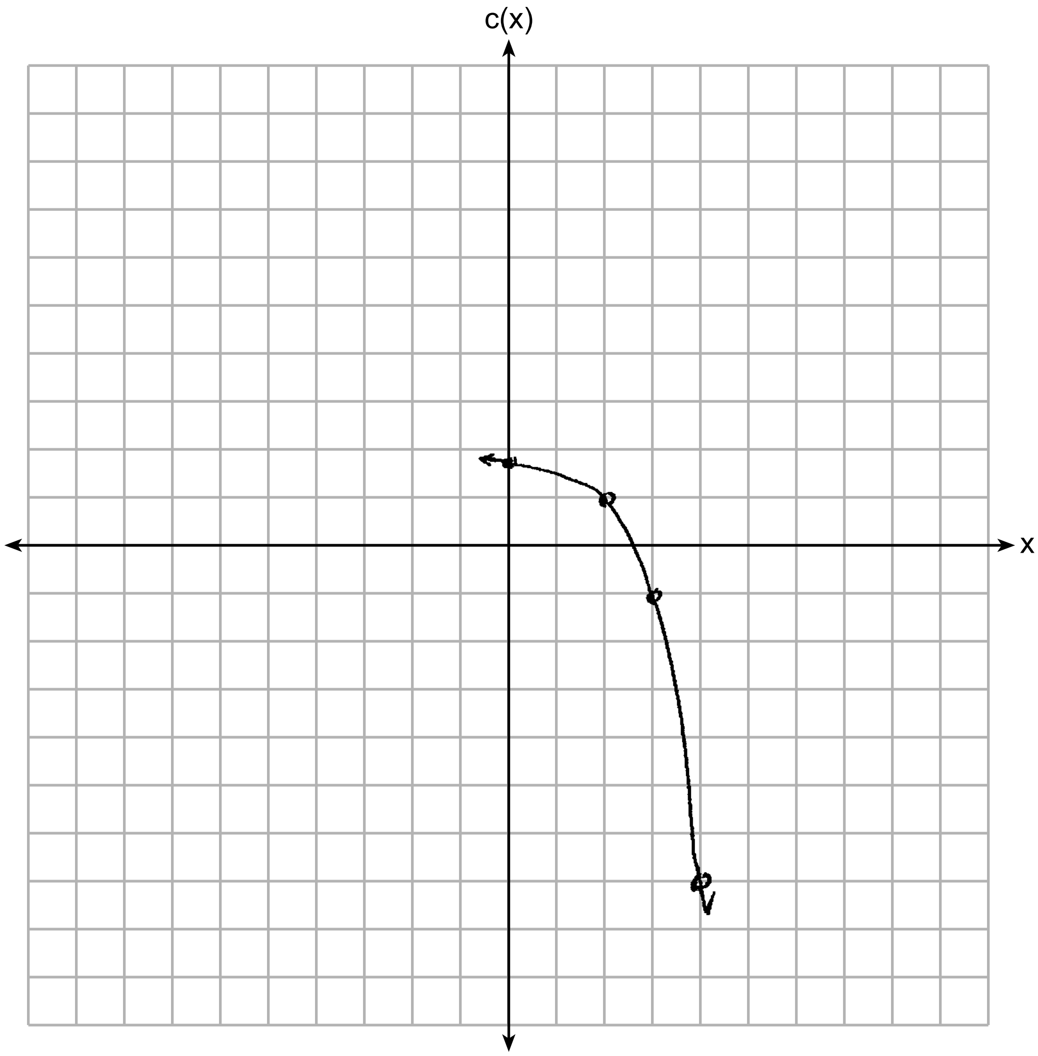


Does the output indicate that the carnival game was unfair? Explain your answer.

No because there is a more unlikely chance

Question 35

35 Graph $c(x) = -9(3)^{x-4} + 2$ on the axes below.



Describe the end behavior of $c(x)$ as x approaches positive infinity.

$c(x) \to -\infty$

Describe the end behavior of $c(x)$ as x approaches negative infinity.

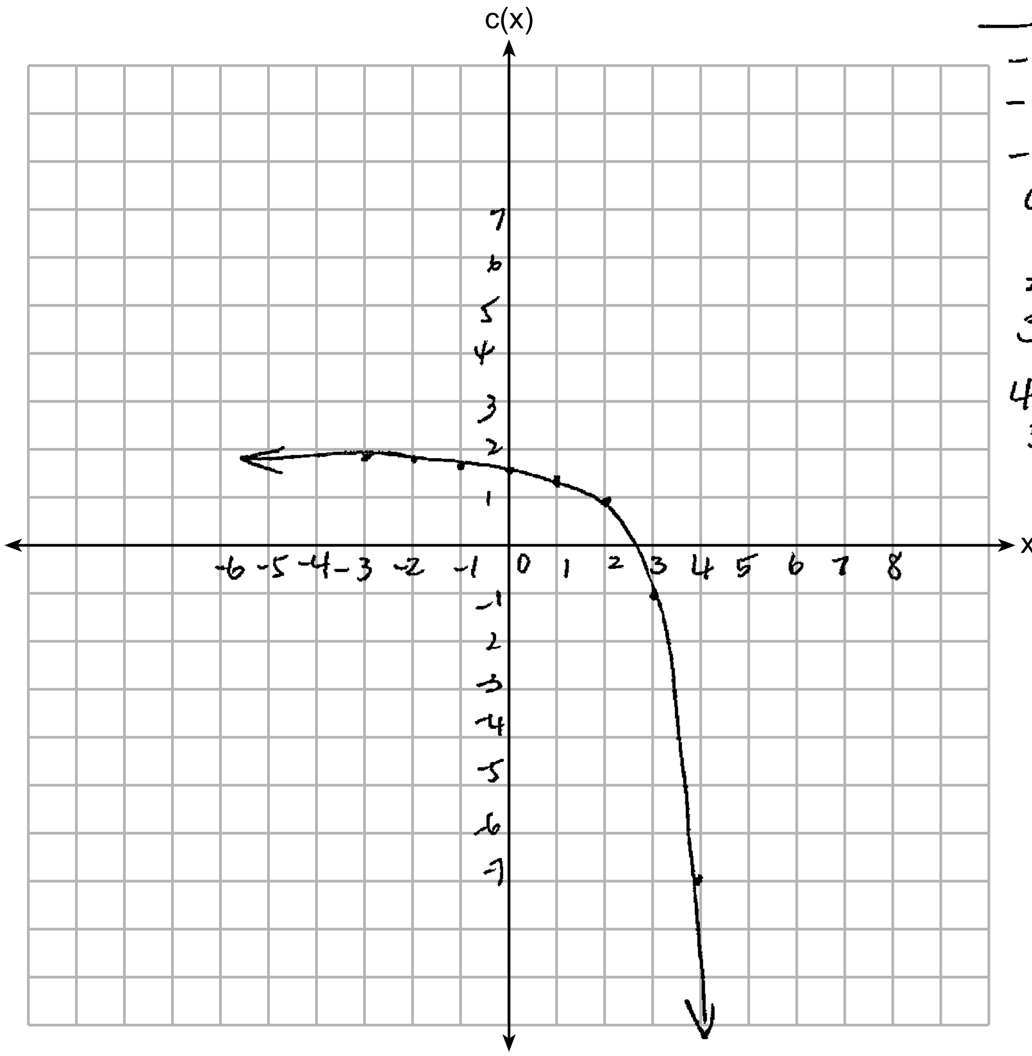
$c(x) \to 2$

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

Question 35

35 Graph $c(x) = -9(3)^{x-4} + 2$ on the axes below.

x	y
-3	1.9958
-2	1.9876
-1	1.9629
0	1.8888
1	1.6666
2	1
3	-1
4	-7
5	-25



Describe the end behavior of $c(x)$ as x approaches positive infinity.

When X is positive infinity, the c(x) will be negative number and Keep going down with negative infinity number.

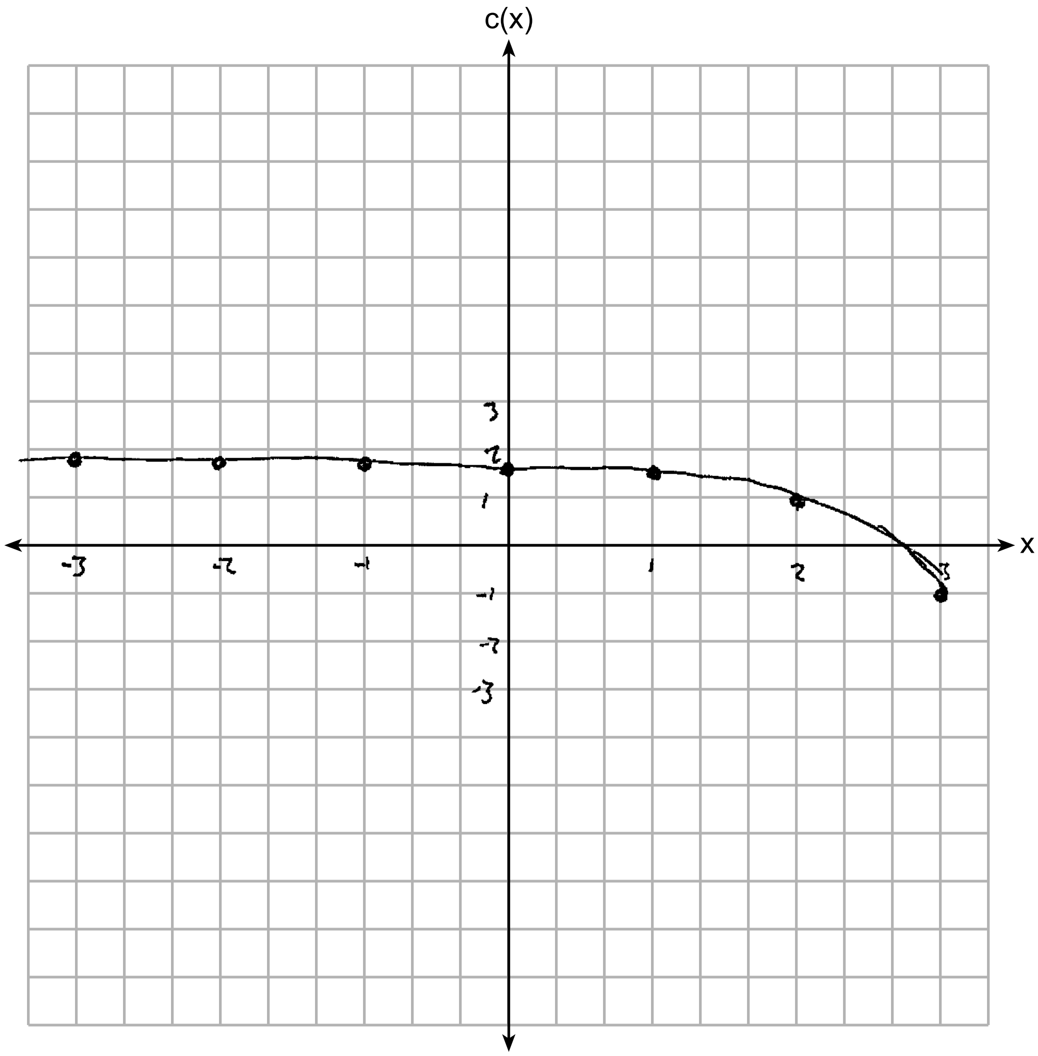
Describe the end behavior of $c(x)$ as x approaches negative infinity.

When x is negative infinity. c(x) will be positive and going left.

Score 3: The student incorrectly stated the end behavior as x approaches negative infinity.

Question 35

35 Graph $c(x) = -9(3)^{x-4} + 2$ on the axes below.



Describe the end behavior of $c(x)$ as x approaches positive infinity.

$x \to \infty$
$c(x) \to -\infty$

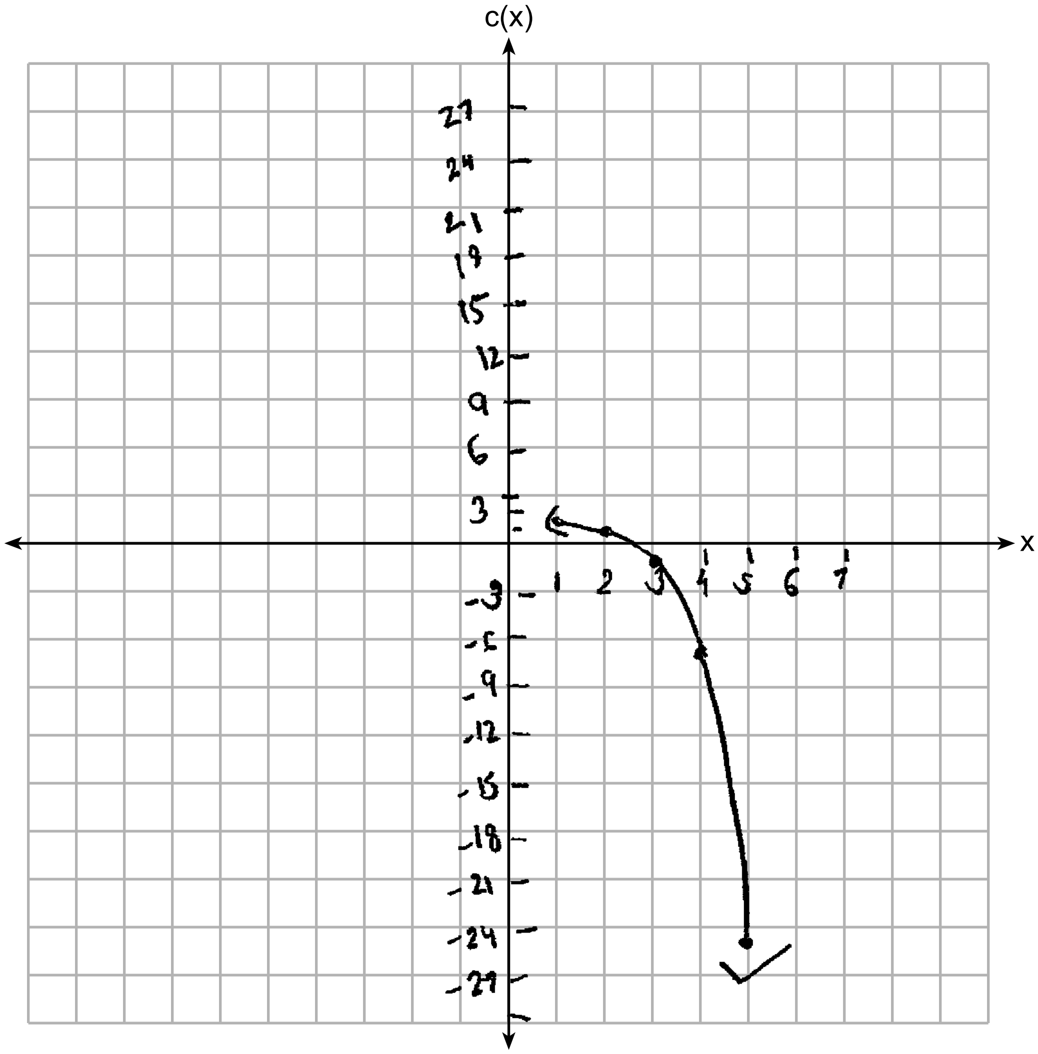
Describe the end behavior of $c(x)$ as x approaches negative infinity.

$x \to -\infty$
$c(x) \to 2$

Score 3: The student made a graphing error.

Question 35

35 Graph $c(x) = -9(3)^{x-4} + 2$ on the axes below.



Describe the end behavior of $c(x)$ as x approaches positive infinity.

It becomes a straight line as it approaches the left side through (-)x and (+) y.

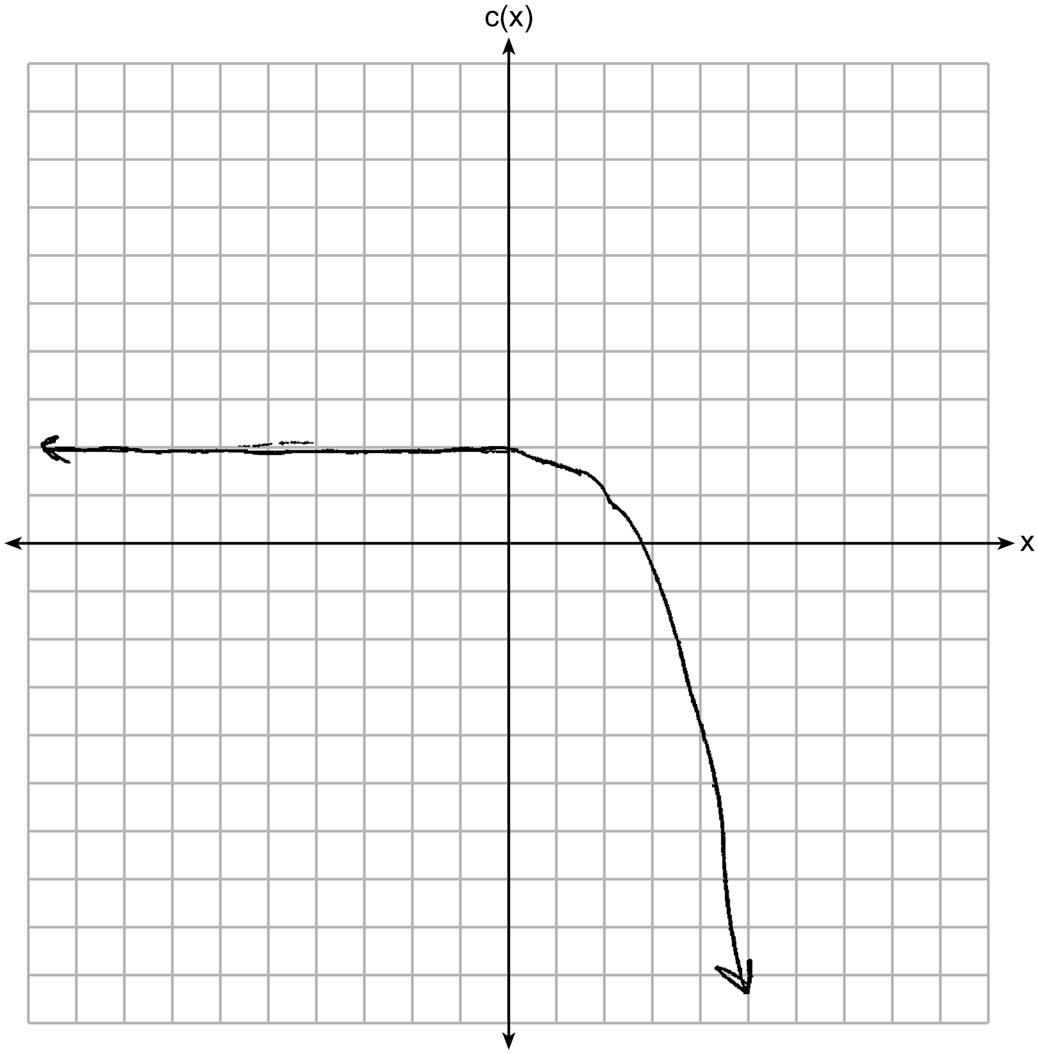
Describe the end behavior of $c(x)$ as x approaches negative infinity.

It falls below and continues through (+)x and (-)y.

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

Question 35

35 Graph $c(x) = -9(3)^{x-4} + 2$ on the axes below.



Describe the end behavior of $c(x)$ as x approaches positive infinity.

As x approaches infinity, c(x) approaches negative infinity

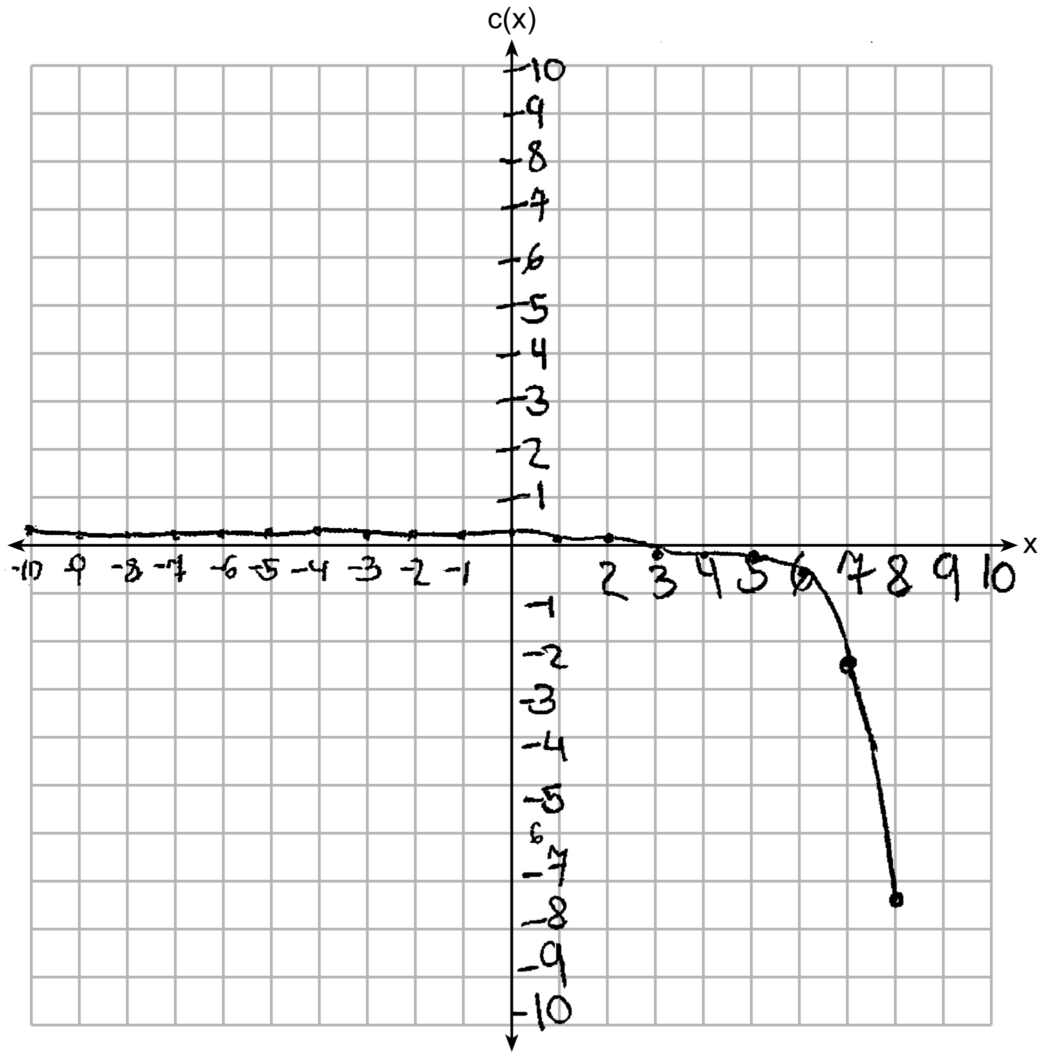
Describe the end behavior of $c(x)$ as x approaches negative infinity.

As x approaches negative infinity, c(x) approaches infinity.

Score 1: The student received one credit for describing the end behavior of $c(x)$ as x approaches positive infinity.

Question 35

35 Graph $c(x) = -9(3)^{x-4} + 2$ on the axes below.



Describe the end behavior of $c(x)$ as x approaches positive infinity.

$c(x) \to \infty$

Describe the end behavior of $c(x)$ as x approaches negative infinity.

$c(x) \to -\infty$

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

36 The monthly high temperature (°F) in Buffalo, New York can be modeled by $B(m) = 24.9\sin(0.5m - 2.05) + 55.25$, where m is the number of the month and January = 1.

6 10

Find the average rate of change in the monthly high temperature between June and October, to the *nearest hundredth*.

JUNE $B(6) = 24.9\sin(0.5(\times 6) - 2.05) + 55.25 = 75.504$

OCTOBER $B(10) = 24.9\sin(0.5(10) - 2.05) + 55.25 = 59.992$

JUNE $(6, 75.504)$ OCTOBER $(10, 59.992)$

Δrate of Change $= \dfrac{\Delta Y}{\Delta X} = \dfrac{75.504 - 59.992}{6 - 10} = -3.878$

$= -3.88$

Explain what this value represents in the given context.

this means that for every month, the temperature decreases by ≈3.88 degrees.

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

Question 36

36 The monthly high temperature (°F) in Buffalo, New York can be modeled by $B(m) = 24.9\sin(0.5m - 2.05) + 55.25$, where m is the number of the month and January = 1.

Find the average rate of change in the monthly high temperature between June and October, to the *nearest hundredth*.

$24.9\sin(0.5 \cdot 6 - 2.05) + 55.25 = 75.504$

$24.9\sin(0.5 \cdot 10 - 2.05) + 55.25 = 59.992$

$59.992 - 75.504 = -15.512$

$-15.512 \div 4 = -3.878$

$-3.88\,°F$

Explain what this value represents in the given context.

-3.88°F shows that between each month from June to October the monthly high temperature dropped an average of 3.88°F each month.

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

Question 36

36 The monthly high temperature (°F) in Buffalo, New York can be modeled by $B(m) = 24.9\sin(0.5m - 2.05) + 55.25$, where m is the number of the month and January = 1.

6 ~~5~~ 10

Find the average rate of change in the monthly high temperature between June and October, to the *nearest hundredth*.

$24.9\sin(0.5(6)-2.05)+55.25 = 55.663$

$24.9\sin(0.5(10)-2.05)+55.25 = 56.531$

$J(6, 55.663)$

$O(10, 56.531)$

$\frac{56.531-55.663}{10-6} = .217 = \boxed{.22°}$

Explain what this value represents in the given context.

The monthly high temperature changes .22° per month in between June and October.

Score 3: The student did not evaluate in radians.

36 The monthly high temperature (°F) in Buffalo, New York can be modeled by $B(m) = 24.9\sin(0.5m - 2.05) + 55.25$, where m is the number of the month and January = 1.

$24.9\sin(0.5(10)-2.05)+55.25$

4 10

Find the average rate of change in the monthly high temperature between June and October, to the *nearest hundredth*.

average rate of change $= \frac{f(b)-f(a)}{b-a} = \frac{f(10)-f(6)}{10-6} = \frac{60-75.5}{4} = 3.875$
≈ 3.88

average rate of change $= 3.88$

Explain what this value represents in the given context.

This value represents that between June and October, the monthly high temperatures differ by about 3.88,

Score 2: The student wrote positive 3.88 and gave an incomplete explanation.

Question 36

36 The monthly high temperature (°F) in Buffalo, New York can be modeled by $B(m) = 24.9\sin(0.5m - 2.05) + 55.25$, where m is the number of the month and January = 1.

Find the average rate of change in the monthly high temperature between June and October, to the *nearest hundredth*.

$B(6) = 24.9\sin(0.5(6) - 2.05) + 55.25$

$B(6) \approx 75.50$

$B(10) = 24.9\sin(0.5(10) - 2.05) + 55.25$

$B(10) \approx 59.99$

$ARC = \frac{75.50 - 59.99}{6 - 10}$

$\boxed{ARC = -3.88^{\circ} \text{ per month}}$

Explain what this value represents in the given context.

In Buffalo, New York, the temperature varies depending on time of year. In summer months, like June it is warm. In fall months, like October, it is cooler.

Score 2: The student received no credit for the explanation.

36 The monthly high temperature (°F) in Buffalo, New York can be modeled by $B(m) = 24.9\sin(0.5m - 2.05) + 55.25$, where m is the number of the month and January = 1.

6 10

Find the average rate of change in the monthly high temperature between June and October, to the *nearest hundredth*.

$\frac{59.992 - 75.504}{10-6} = -3.878$ $\boxed{3.878}$

Explain what this value represents in the given context.

number month that comes
in the year.

Score 1: The student made a rounding error and received no credit for the explanation.

Question 36

36 ~~The monthly~~ high temperature (°F) in Buffalo, New York can be modeled by $B(m) = 24.9\sin(0.5m - 2.05) + 55.25$, where m is the number of the month and January = 1.

Find the average rate of change in the monthly high temperature between June and October, to the *nearest hundredth*.

June - 6
October - 10

$B(6) = 24.9\sin(0.5(6) - 2.05) + 55.25$
$B(6) = 55.6628$
$B(10) = 24.9\sin(0.5(10) - 2.05) + 55.25$
$B(10) = 56.5315$

$\dfrac{10-6}{56.5315 - 55.6628} =$

4.60

Explain what this value represents in the given context.

In the given context, 4.60 represents the monthly high temperature increase from June to October in Buffalo NY.

Score 1: The student received one credit for an incomplete explanation.

36 The monthly high temperature (°F) in Buffalo, New York can be modeled by $B(m) = 24.9\sin(0.5m - 2.05) + 55.25$, where m is the number of the month and January = 1.

Find the average rate of change in the monthly high temperature between June and October, to the *nearest hundredth*.

$B(6) = 24.9\sin(0.5(6) - 2.05) + 55.25$
$= 24.9\sin(.95) + 55.25$
$= \cancel{.413} + 55.25$
$B(6) = 55.663$

$B(10) = 24.9\sin(0.5(10) - 2.05$
$B(10) = 24.9\sin(2.95) + 55.25$
$\cancel{B(10) = 1.281 + 55.25}$
$B(10) = 56.531$

Explain what this value represents in the given context.

The average monthly high temperature in Buffalo, New York is relatively the same in June and October.

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

37 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature 400°F
T_R: room temperature 75°F
r: rate of cooling of the object .0735
t: time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

$T = (T_0 - T_r)e^{-rt} + T_R$

$T = (400 - 75)e^{-.0735t} + 75$

Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes.

$T = (400 - 75)e^{-.0735t} + 75$

$T = (400 - 75)e^{-.0735(5)} + 75$

$= (325)e^{-.3675} + 75$

$= 300.0505812$

$= 300$ degrees

Question 37 is continued on the next page.

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

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*.

$T = (T_0 - T_r)e^{-rt} + T_r$

$\log_b a = n$

$b^n = a$

$270 = (450 - 75)e^{-r(8)} + 75$

$270 = (375)e^{-r8} + 75$

$-75 \qquad -75$

$\frac{195}{375} = \frac{375e^{-r8}}{375}$

$.52 = e^{-r8}$

$\log_e .52 = -r8$

$\frac{-.6539264674}{8} = \frac{-r8}{8}$

$-1(-.0817408084) = r$

$.0817 = r$

The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

$(375)e^{-.0817t} + 75 = (325)e^{-.0735t} + 75$

I plugged them into y

$2^{nd} \rightarrow$ calc $\rightarrow$ intersect finder

about 17 minutes

Question 37

37 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature
T_R: room temperature
r: rate of cooling of the object
t: time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

T_0: 400°F $T=(T_0-T_R)e^{-rt}+T_R$
T_R: 75°F $T=(400-75)e^{-0.0735t}+75$
r: 0.0735 $\boxed{T=325e^{-0.0735t}+75}$
t: ?

Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes.

$t=5$
$T=325e^{-0.0735(5)}+75$
$T=300.0505812$
The t-shirt will be about 300°F

Question 37 is continued on the next page.

Score 5: The student made one computational error in the fourth part.

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*.

$T_0 = 450°F$

$T_R = 75°F$

$r = ?$

$t = 8$

$T = 270°F$

$T = (T_0 - T_R)e^{-rt} + T_R$

$270 = (450-75)e^{-r(8)} + 75$

$-75 \quad = \quad -75$

$\frac{195}{375} = \frac{375e^{-8r}}{375}$

$\ln(0.52 = e^{-8r})$

$\ln .52 = \ln e^{-8r}$

$\ln .52 = -8r \ln e$

$\frac{\ln .52}{-8} = r$

$r = 0.0817408084$

$r \approx 0.0817$

The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

T-shirt

$T_0 = 400°F$

$T_R = 75°F$

$r = 0.0735$

$t = ?$

$T = 325e^{-0.0735t} + 75$

hoodie

$T_0 = 450$

$T_R = 75$

$r = 0.0917$

$t = ?$

$T = (450-75)e^{-0.0917t} + 75$

$325e^{-0.0735t} + 75 = 375e^{-0.0917t} + 75$

$-75 = -75$

$\frac{325e^{-0.0735t}}{325} = \frac{375e^{-0.0917t}}{325}$

$\ln\left(e^{-0.0735t} = \frac{375}{325}e^{-0.0917t}\right)$

$-0.0735t \ln e = \ln \frac{375}{325} + 0.0917t \ln e$

$-0.1652t = \ln \frac{375}{325} \quad t = -1$

Question 37

37 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature
T_R: room temperature
r: rate of cooling of the object
t: time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

$$T = (400 - 75)e^{-.0735t} + 75$$

Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes.

$$T = (400-75)e^{-.0735(5)} + 75$$

$$T = 300^\circ$$

Question 37 is continued on the next page.

Score 4: The student received no credit for the fourth part.

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*.

$$270 = (450 - 75)e^{-r(8)} + 75$$

$$195 = (375)e^{-r(8)}$$

$$\frac{\ln\frac{195}{375}}{-8} = \frac{-r(8)\cancel{\ln e}}{-8}$$

$$r = 0.0817$$

The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

plug equations in to calculator

$t = 18$

Question 37

37 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature
T_R: room temperature
r: rate of cooling of the object
t: time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

$$T = (400^\circ - 75^\circ)e^{-.0735(5)} + 75$$

Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes.

$$T = 300^\circ$$

Question 37 is continued on the next page.

Score 4: The student made a notation error in the first part and wrote an incorrect time in the fourth part.

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*.

$$270^\circ = (450^\circ - 75^\circ)e^{-r(8)} + 75$$
$$-75 \qquad\qquad\qquad\qquad -75$$

$$\frac{195}{375} = \frac{(375^\circ)}{375}e^{-r(8)}$$

$$.52 = e^{-r(8)}$$

$$\frac{\ln(.52)}{8} = \frac{-r(8)}{8} \qquad -r = -.08 \qquad r = 0.0817$$

The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

18 minutes

x	Hoodie	T-shirt
17	168.51	168.16
17.5	164.76	164.8
18	161.17	161.56

Question 37

37 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature 400

T_R: room temperature 75

r: rate of cooling of the object 0.0735

t: time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

$$T = (400 - 75)e^{-0.0735t} + 75$$

Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes.

Question 37 is continued on the next page.

Score 3: The student received one credit for part one and two credits for part three.

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*.

$270 = (450-75)e^{-8x} + 75$

$195 = 375e^{-8x}$

$0.52 = e^{-8x}$

$\dfrac{\ln 0.52 = -8x \ln e}{-8}$

$r = 0.0817408084$

$\boxed{r = 0.0817}$

The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

$375e^{-0.0817t} = 325e^{-0.0735t}$

$-0.0817t \ln 375e = \dfrac{-0.0735t \ln 325e}{\ln 375e}$

$-0.0817t\ 1.021094418 = -0.0735t$

$= 0.0082t$

$\boxed{125 \text{ minutes}}$

Question 37

37 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature

T_R: room temperature

r: rate of cooling of the object

t: time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

$$T = (400 - 75)e^{-0.0735(5)} + 75$$

Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes.

$= 300°F$

Question 37 is continued on the next page.

Score 3: The student made a notation error in part one, a rounding error in part three, and showed no work in part four.

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*.

$270 = (450 - 75)e^{-r(8)} + 75$

$-75 \qquad\qquad\qquad\qquad -75$

$\frac{195}{375} = \frac{375e^{-r8}}{375}$

$.52 = e^{-8r}$

$\frac{\ln .52}{-8} = \frac{-8r}{-8}$

$r = 0.082$

The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

17 minutes

37 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature
T_R: room temperature
r: rate of cooling of the object
t: time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

$T_0 = 400°F$
$r = .0735$
$T_R = 75°$

$(400° - 75°)e^{-(.0735)t} + 75°$

Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes.

$(400° - 75°)e^{-(.0735)(5)} + 75 = 300.0505812° = T$

Question 37 is continued on the next page.

Score 2: The student received two credits for part three.

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*.

$(450-75)e^{-4r}+75=270$

$-75 \quad -75$

$\frac{195}{375}=\frac{(375)e^{-r8}}{375}$

$.52=e^{-r8}$

$\frac{\ln(.52)}{-8}=\frac{-r8}{-8}$

$r=.0817$

* The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

Question 37

37 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature
T_R: room temperature
r: rate of cooling of the object
t: time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

$$T = (400-75)e^{-0.0735t} + 75$$

Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes.

$$T = (400-75)e^{-0.0735(5)} + 75$$

$$\boxed{T = 300°F}$$

Question 37 is continued on the next page.

Score 2: The student received no credit on parts three and four.

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*.

$270 = (450-75)e^{-8r} + 75$
$-75 \qquad\qquad -75$

$\frac{195}{375} = \frac{375e^{-8r}}{375}$

$.52 = e^{-8r}$

$\ln .52 = \ln e^{-8r}$

$\frac{\ln .52}{-8} = \frac{-8r}{-8}$

$\boxed{r = -.082}$

The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

$\frac{300}{325} = \frac{(400-75)e^{-.082t}}{325}$

$.923 = e^{-.082t}$

$\frac{\ln .923}{-.082} = \frac{\ln e^{-.082t}}{-.082}$

$\boxed{x = 1 \text{ minute}}$

Question 37

37 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature
T_R: room temperature
r: rate of cooling of the object
t: time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

$$T = (400 - 75)e^{-.0735(5)} + 75$$

Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes.

300°F

Question 37 is continued on the next page.

Score 1: The student only received credit for the second part.

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*.

$$= (450 - 75)e^{-x(8)} + 75$$

$$195 = (450 - 75)e^{-8x}$$

$$.52000$$

The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

7 mintes

Question 37

37 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature 400

T_R: room temperature 75

r: rate of cooling of the object 0.0735

t: time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

$$T = (400-75)e^{-0.0735t} + 75$$

Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes.

$$T = (400-75)e^{-0.0735(5)} + 75$$

T = 225 degrees

Question 37 is continued on the next page.

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

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*.

$270 = (450-75)e^{-r(8)}+75$

$\frac{270}{375} = \frac{375e^{-r(8)}}{375}+75$

$\frac{18}{25} = e^{-8r}+75$
-75

$\frac{18}{25}-75 = e^{-8r}$

$\log\frac{18}{25}-75 = \log e^{-8r}$

$\frac{-75\log\frac{18}{25}}{-8\log e} = \frac{-8r\log e}{-8\log e}$

$-0.5809 = r$

The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.

$(270-75)e^{-(0.5809)t}+75 = (225-75)e^{-0.0735t}+75$
-75

$195e^{-0.5809t-75} = 150e^{-0.0735t}$

$-0.5809t\log 195e = -0.0735t\log 150e$

Question 37

37 Objects cool at different rates based on the formula below.

$$T = (T_0 - T_R)e^{-rt} + T_R$$

T_0: initial temperature
T_R: room temperature
r: rate of cooling of the object
t: time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

$T = (400-75)^{-.0735 \cdot 5} + 75$

Use the equation to find the temperature of the shirt, to the *nearest degree*, after five minutes.

$(325)^{-.07355} + 75 \quad = 78°$ degrees

Question 37 is continued on the next page.

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

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth*.

$T = (450-75)^{0} + 75$ $\boxed{.6}$

The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the *nearest minute*.