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

ALGEBRA II

Thursday, January 24, 2019 — 1:15 to 4:15 p.m., only

MODEL RESPONSE SET

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25 Justify why $\dfrac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}}$ is equivalent to $x^{\frac{-1}{12}}y^{\frac{2}{3}}$ using properties of rational exponents, where $x \neq 0$ and $y \neq 0$.

$$\sqrt[3]{x^2y^5} = \sqrt[3]{x^2} \cdot \sqrt[3]{y^5}$$

$$\boxed{x^{\frac{2}{3}}} \qquad \boxed{y^{\frac{5}{3}}}$$

$$\sqrt[4]{x^3y^4} = \sqrt[4]{x^3} \cdot \sqrt[4]{y^4}$$

$$x^{\frac{3}{4}} \qquad y^{1}$$

$$\underbrace{\frac{x^{\frac{2}{3}}}{x^{\frac{3}{4}}} = x^{-\frac{1}{12}} \qquad \frac{y^{\frac{5}{3}}}{y^{\frac{3}{3}}} = y^{\frac{2}{3}}}_{x^{-\frac{1}{12}} \cdot y^{\frac{2}{3}}}$$

$$\boxed{x^{-\frac{1}{12}}y^{\frac{2}{3}}}$$

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

Question 25

25 Justify why $\frac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}}$ is equivalent to $x^{\frac{-1}{12}}y^{\frac{2}{3}}$ using properties of rational exponents, where $x \neq 0$ and $y \neq 0$.

$$\frac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}} = \frac{x^{\frac{2}{3}}y^{\frac{5}{3}}}{x^{\frac{3}{4}}y}$$

$$= x^{-\frac{1}{12}}y^{\frac{2}{3}}$$

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

25 Justify why $\dfrac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}}$ is equivalent to $x^{\frac{-1}{12}}y^{\frac{2}{3}}$ using properties of rational exponents, where $x \neq 0$ and $y \neq 0$.

$$\frac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}} = \frac{(x^2y^5)^{1/3}}{(x^3y^4)^{1/4}}$$

Score 1: The student only rewrote the radicals with rational exponents.

Question 25

25 Justify why $\frac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}}$ is equivalent to $x^{\frac{-1}{12}}y^{\frac{2}{3}}$ using properties of rational exponents, where $x \neq 0$ and $y \neq 0$.

$x = 4$
$y = 3$

$$\frac{\sqrt[3]{4^2 3^5}}{\sqrt[4]{4^3 3^4}} = 1.853144012$$

$$4^{\frac{-1}{12}} 3^{\frac{2}{3}} = 1.853144012$$

equivalent

Score 1: The student gave an incomplete justification by only evaluating $x = 4$ and $y = 3$.

Question 25

25 Justify why $\dfrac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}}$ is equivalent to $x^{\frac{-1}{12}}y^{\frac{2}{3}}$ using properties of rational exponents, where $x \neq 0$ and $y \neq 0$.

$$\frac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}} : x^{\frac{-1}{12}}y^{\frac{2}{3}}$$

let $x = \cancel{7}$
let $y = 2$

$$\frac{\sqrt[3]{2^2 2^5}}{\sqrt[4]{2^3 2^4}}$$

$$1^{\frac{-1}{12}} \cdot 2^{\frac{2}{3}}$$

$$\frac{\sqrt[3]{32}}{\sqrt[4]{16}} \quad \frac{\sqrt[3]{32}}{2} \quad \frac{\cancel{8}\sqrt{4}}{\cancel{2}}$$

$-\frac{1}{12} \cdot 1.58740052$

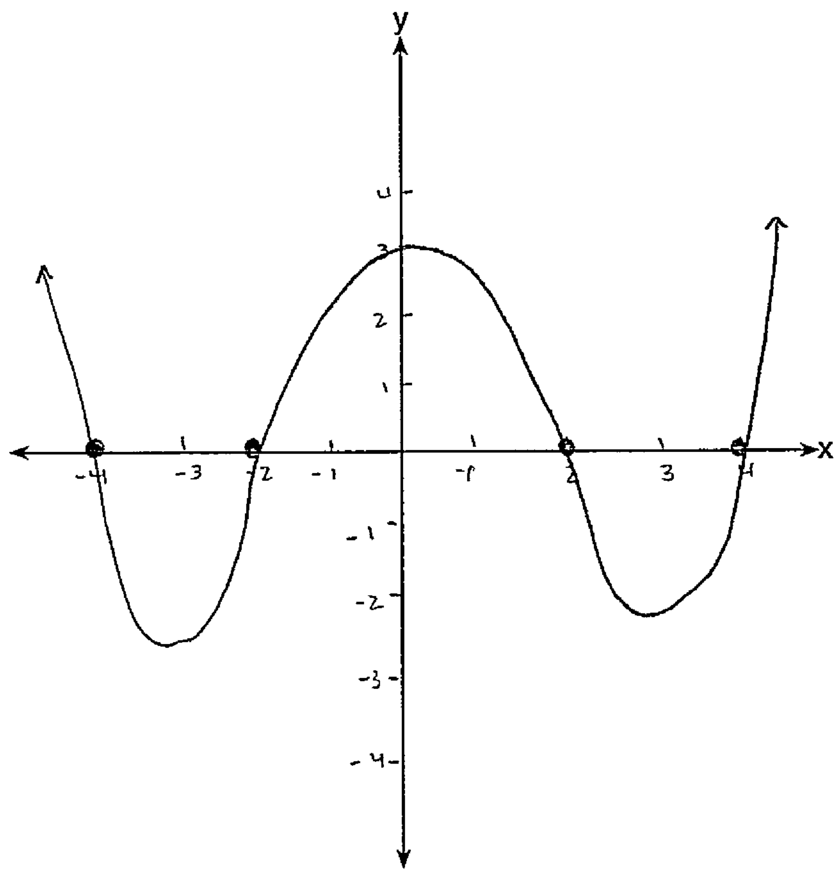
$= -.1322834721$

$\sqrt[4]{4} = 8$

Score 0: The student gave a completely incoherent response.

Question 26

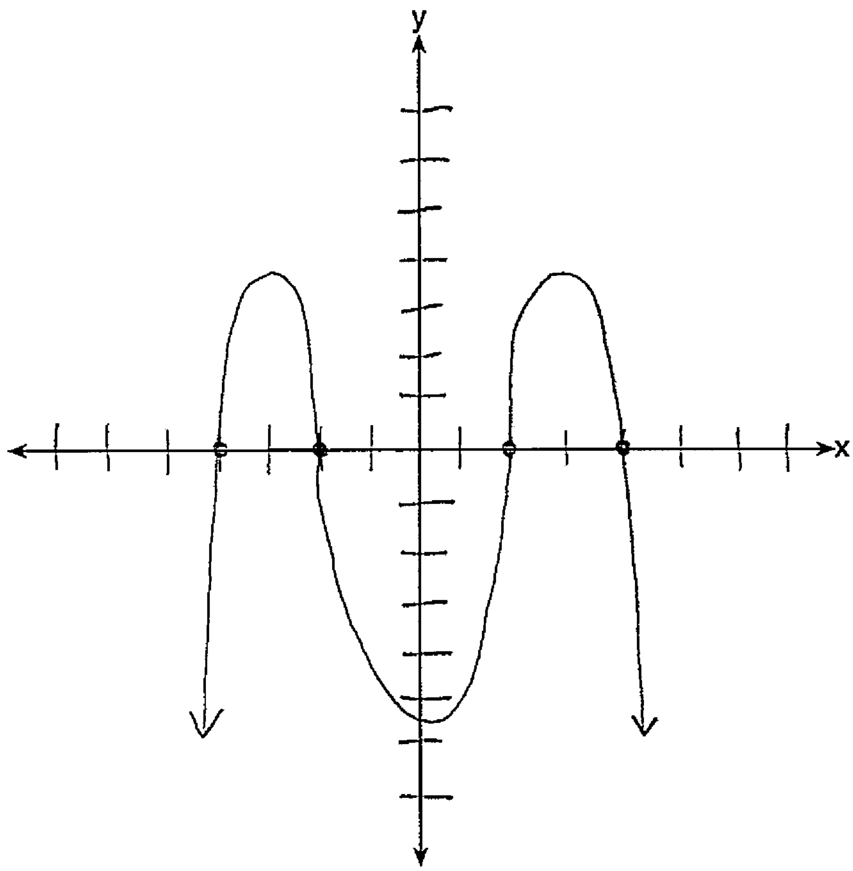
26 The zeros of a quartic polynomial function are 2, −2, 4, and −4. Use the zeros to construct a possible sketch of the function, on the set of axes below.



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

Question 26

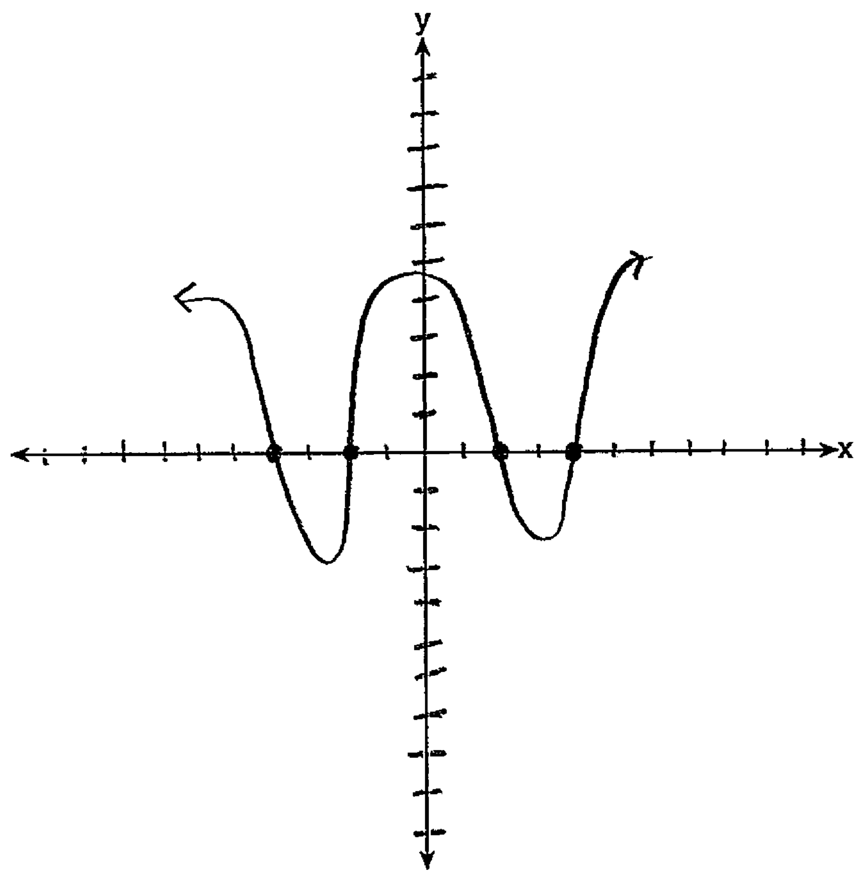
26 The zeros of a quartic polynomial function are 2, -2, 4, and -4. Use the zeros to construct a possible sketch of the function, on the set of axes below.



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

Question 26

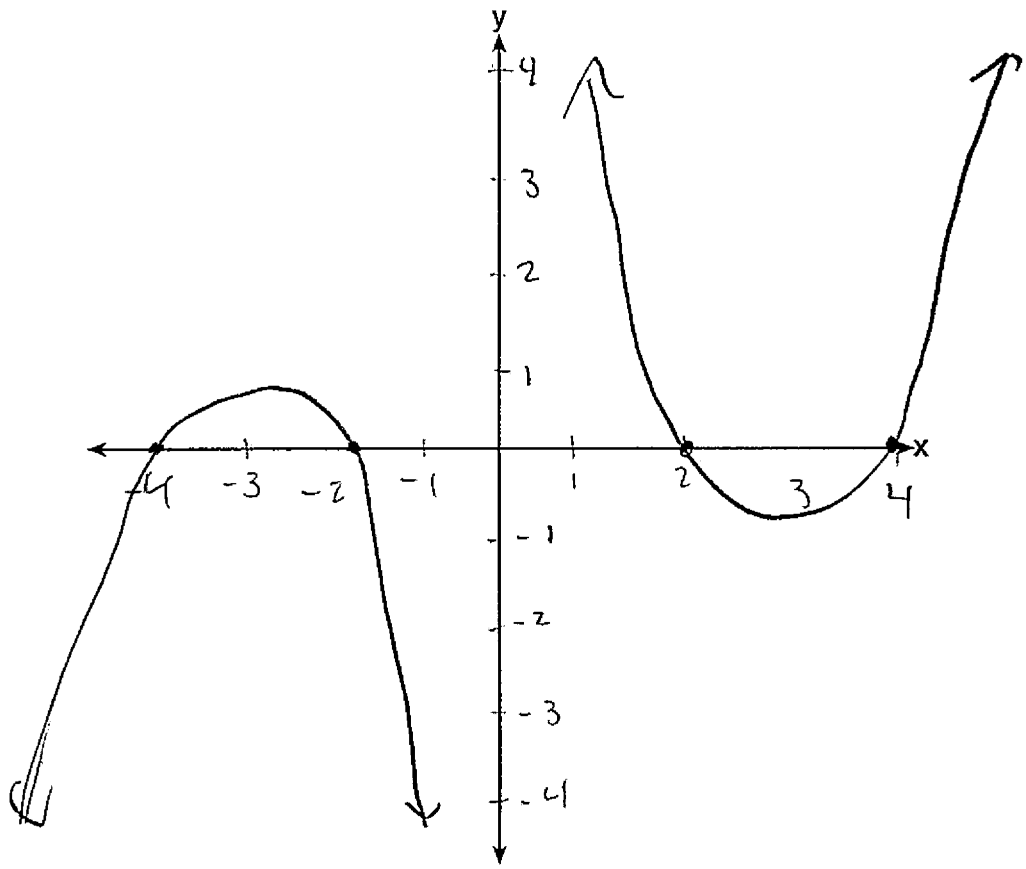
26 The zeros of a quartic polynomial function are 2, −2, 4, and −4. Use the zeros to construct a possible sketch of the function, on the set of axes below.



Score 1: The student incorrectly graphed the end behavior.

Question 26

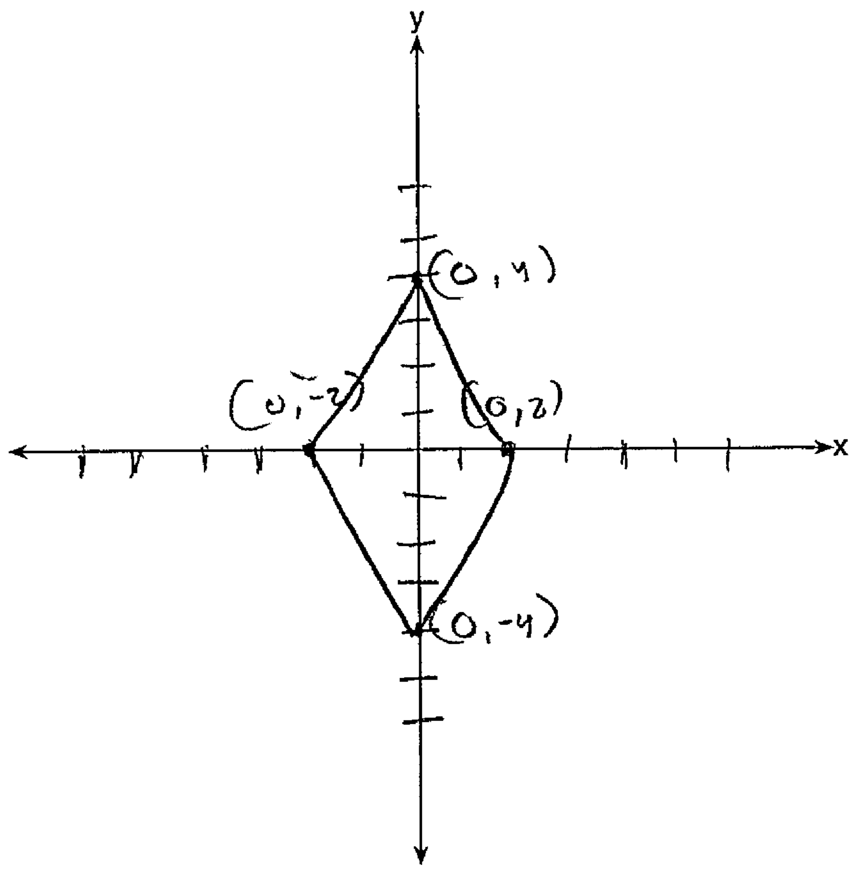
26 The zeros of a quartic polynomial function are 2, −2, 4, and −4. Use the zeros to construct a possible sketch of the function, on the set of axes below.



Score 1: The student did not graph a quartic polynomial function.

Question 26

26 The zeros of a quartic polynomial function are 2, −2, 4, and −4. Use the zeros to construct a possible sketch of the function, on the set of axes below.



Score 0: The student's sketch is completely incorrect.

27 Erin and Christa were working on cubing binomials for math homework. Erin believed they could save time with a shortcut. She wrote down the rule below for Christa to follow.

$$(a + b)^3 = a^3 + b^3$$

Does Erin's shortcut always work? Justify your result algebraically.

$$(a+b)(a+b)(a+b) = a^3+b^3$$

$$(a^2+2ab+b^2)(a+b)=a^3+b^3$$

$$a^3+a^2b+2a^2b+2ab^2+ab^2+b^3$$

$$a^3+3a^2b+3ab^2+b^3$$

No Erin's shortcut does not work.

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

Question 27

27 Erin and Christa were working on cubing binomials for math homework. Erin believed they could save time with a shortcut. She wrote down the rule below for Christa to follow.

$$(a + b)^3 = a^3 + b^3$$

Does Erin's shortcut always work? Justify your result algebraically.

$(a+b)(a+b)(a+b) = a^3+b^3$

$(a^2+2ab+b^2)(a+b) = a^3+b^3$

$a^3+2a^2b+ab^2+a^2b+2ab^2+b^3 = a^3+b^3$

No

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

27 Erin and Christa were working on cubing binomials for math homework. Erin believed they could save time with a shortcut. She wrote down the rule below for Christa to follow.

$$(a+b)^3 = a^3 + b^3$$

Does Erin's shortcut always work? Justify your result algebraically.

No

$(A+B)^3 \neq a^3 + B^3$

$(A+B)^3 = (A+B)(A+B)(A+B)$

$= A^2 + AB + BA + B^2 + \cancel{A^2 + AB} + BA + B^2$

$= 2A^2 + 2AB + 2BA + 2B^2$

Score 1: The student incorrectly distributed.

Question 27

27 Erin and Christa were working on cubing binomials for math homework. Erin believed they could save time with a shortcut. She wrote down the rule below for Christa to follow.

$$(a + b)^3 = a^3 + b^3$$

Does Erin's shortcut always work? Justify your result algebraically.

No, it does not always work

$(9+19)^3 = 9^3 + 19^3$

$(28)^3 = 729 + 6859$

$21952 = 7588$

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

Question 27

27 Erin and Christa were working on cubing binomials for math homework. Erin believed they could save time with a shortcut. She wrote down the rule below for Christa to follow.

$$(a + b)^3 = a^3 + b^3$$

Does Erin's shortcut always work? Justify your result algebraically.

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

$$a+b = \sqrt{a^3+b^3}$$

No because you will not get the exact value.

Score 0: The student stated No, but showed no further correct work.

Question 28

28 The probability that a resident of a housing community opposes spending money for community improvement on plumbing issues is 0.8. The probability that a resident favors spending money on improving walkways given that the resident opposes spending money on plumbing issues is 0.85. Determine the probability that a randomly selected resident opposes spending money on plumbing issues and favors spending money on walkways.

$\boxed{P(FW \cap NP) = .68}$

$P(NP) = .8$

$P(fw|NP) = .85$

$P(fw|NP) = \frac{P(FW \cap NP)}{P(NP)} = .85$

$\frac{P(FW \cap NP)}{.8} = .85$

$\times .8 \quad \times .8$

$P(FW \cap NP) = .68$

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

28 The probability that a resident of a housing community opposes spending money for community improvement on plumbing issues is 0.8. The probability that a resident favors spending money on improving walkways given that the resident opposes spending money on plumbing issues is 0.85. Determine the probability that a randomly selected resident opposes spending money on plumbing issues and favors spending money on walkways.

$$\frac{8}{10} \cdot \frac{85}{100}$$

$$\boxed{\frac{680}{1000}}$$

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

Question 28

28 The probability that a resident of a housing community opposes spending money for community improvement on plumbing issues is 0.8. The probability that a resident favors spending money on improving walkways given that the resident opposes spending money on plumbing issues is 0.85. Determine the probability that a randomly selected resident opposes spending money on plumbing issues and favors spending money on walkways.

$$\frac{0.8}{0.85}$$

Prob = 0.9411764706

Score 1: The student divided rather than multiplied to determine the probability.

Question 28

28 The probability that a resident of a housing community opposes spending money for community improvement on plumbing issues is 0.8. The probability that a resident favors spending money on improving walkways given that the resident opposes spending money on plumbing issues is 0.85. Determine the probability that a randomly selected resident opposes spending money on plumbing issues and favors spending money on walkways.

$0.8 + 0.85 = 1.65$

$\frac{0.8}{1.65} + \frac{0.85}{1.65}$

Score 0: The student made multiple errors.

Question 29

29 Rowan is training to run in a race. He runs 15 miles in the first week, and each week following, he runs 3% more than the week before. Using a geometric series formula, find the total number of miles Rowan runs over the first ten weeks of training, rounded to the *nearest thousandth*.

$$S_n = \frac{a_1 - a_1 r^n}{1-r}$$

$$S_{10} = \frac{15 - 15(1.03)^{10}}{1-1.03} = \boxed{171.958 \text{ miles}}$$

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

Question 29

29 Rowan is training to run in a race. He runs 15 miles in the first week, and each week following, he runs 3% more than the week before. Using a geometric series formula, find the total number of miles Rowan runs over the first ten weeks of training, rounded to the *nearest thousandth*.

$15(1.03)^{x-1}$ $x = \#$ of weeks trained after week 1

$$m = \sum_{x=1}^{10} 15(1.03)^{x-1} \Rightarrow \underline{171.958 \text{ miles}}$$

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

Question 29

29 Rowan is training to run in a race. He runs 15 miles in the first week, and each week following, he runs 3% more than the week before. Using a geometric series formula, find the total number of miles Rowan runs over the first ten weeks of training, rounded to the *nearest thousandth*.

0.03

Week 1 - 15
Week 2 - 15.45
Week 3 - 15.9135
Week 4 - 16.390905
Week 5 - 16.88263215
Week 6 - 17.38911111
Week 7 - 17.91078444
Week 8 - 18.44810797
Week 9 - 19.00155121
\+ Week 10 - 19.57159775

171.9581896

tenth hund. thous.

The total number of miles Rowan runs over the first ten weeks of training is 171.958 miles.

Score 1: The student used expansion rather than a geometric series formula.

Question 29

29 Rowan is training to run in a race. He runs 15 miles in the first week, and each week following, he runs 3% more than the week before. Using a geometric series formula, find the total number of miles Rowan runs over the first ten weeks of training, rounded to the *nearest thousandth*.

$$S_n = \frac{a_1 - a_1 r^n}{1 - r}$$

$$\frac{15 - 15(.03)^{10}}{1 - .03} = \frac{15}{.97} = \boxed{15.464}$$

Score 1: The student incorrectly substituted for the ratio.

Question 29

29 Rowan is training to run in a race. He runs 15 miles in the first week, and each week following, he runs 3% more than the week before. Using a geometric series formula, find the total number of miles Rowan runs over the first ten weeks of training, rounded to the *nearest thousandth*.

$$S_n = \frac{a_1 - a_1 r^n}{1-r}$$

$$S_n = \frac{15 - 15(0.03)^n}{1-0.03}$$

$$S_{10} = \frac{15 - 15(0.03)^{10}}{1-0.03}$$

$$S_{10} = \boxed{172.220 \text{ miles}}$$

15
15.45
15.91
16.39
16.48
16.97
17.48
18.00
18.54
20.00

Score 0: The student made multiple errors.

Question 30

30 The average monthly high temperature in Buffalo, in degrees Fahrenheit, can be modeled by the function $B(t) = 25.29\sin(0.4895t - 1.9752) + 55.2877$, where t is the month number (January = 1). State, to the *nearest tenth*, the average monthly rate of temperature change between August and November.

August = 8

$B(8) = 25.29\sin(0.4895 \cdot 8 - 1.9752) + 55.2877$

$B(8) = 78.86622498$

November = 11

$B(11) = 25.29\sin(0.4895 \cdot 11 - 1.9752) + 55.2877$

$B(11) = 48.59796025$

$$\frac{B(8)-B(11)}{8-11} = \frac{78.86622498 - 48.59796025}{8-11}$$

$$= \frac{30.26826473}{-3}$$

$$\approx -10.1^\circ$$

Explain its meaning in the given context.

$\boxed{-10.1^\circ}$ This means that through August to November, the temperature drops down an average of 10.1° per month.

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

Question 30

30 The average monthly high temperature in Buffalo, in degrees Fahrenheit, can be modeled by the function $B(t) = 25.29\sin(0.4895t - 1.9752) + 55.2877$, where t is the month number (January = 1). State, to the *nearest tenth*, the average monthly rate of temperature change between August and November.

8

11

$B(8) = 25.29\sin(.4895(8) - 1.9752) + 55.2877$

$B(8) = 78.9°$

$B(11) = 25.29\sin(.4895(11) - 1.9752) + 55.2877$

$B(11) = 48.6°$ $\frac{48.6 - 78.9}{11 - 8} = \frac{-30.3}{3} = -10.3$

Explain its meaning in the given context.

The average monthly rate of temperature change between August and November is -10.3°. Given the context, this means the average monthly high temperature in Buffalo changes by an average of -10.3° each month between August and November.

Score 1: The student made a division error.

30 The average monthly high temperature in Buffalo, in degrees Fahrenheit, can be modeled by the function $B(t) = 25.29\sin(0.4895t - 1.9752) + 55.2877$, where t is the month number (January = 1). State, to the *nearest tenth*, the average monthly rate of temperature change between August and November.

8 +3= 11

(8th month) August= 25.29 sin (0.4895(8) -1.9752) +55.2877

(11th month) November =25.29 sin(0.4895(11) -1.9752) +55.2877

(august) B(8) = 56.14 september B(9) = 56.36

november B(11) = 56.79 October B(10) = 56.58

Explain its meaning in the given context.

56.79
-56.14
0.65
3 (months)
$\boxed{0.2}$

* between each month from August to november (3 months) the temperature changed about $\boxed{.2 \text{ degrees}}$

Score 1: The student was incorrectly in degree mode.

Question 30

30 The average monthly high temperature in Buffalo, in degrees Fahrenheit, can be modeled by the function $B(t) = 25.29\sin(0.4895t - 1.9752) + 55.2877$, where t is the month number (January = 1). State, to the *nearest tenth*, the average monthly rate of temperature change between August and November.

August

$25.29\sin(0.4895(8)-1.9752)+55.2877$

78.86622498

November

$25.29\sin(0.4895(11)-1.9752)+55.2877$

48.59796025

$\frac{11-8}{48.6-78.9} = -.09900990l$

Explain its meaning in the given context.

Score 0: The student used an incorrect formula and gave no explanation.

30 The average monthly high temperature in Buffalo, in degrees Fahrenheit, can be modeled by the function $B(t) = 25.29\sin(0.4895t - 1.9752) + 55.2877$, where t is the month number (January = 1). State, to the *nearest tenth*, the average monthly rate of temperature change between August and November.

11 8

$B(8) = 25.29\sin(0.4895(8) - 1.9752) + 55.2877$
$= 25.29\sin(1.9408) + 55.2877$
$= 23.57852498 + 55.2877$
$= 78.86622498$

$B(11) = 25.29\sin(.4895(11) - 1.9752) + 55.2877$
$= 25.29\sin(3.4093) + 55.2877$
$= -6.6897397\,02 + 55.2877$
$= 48.5976025$

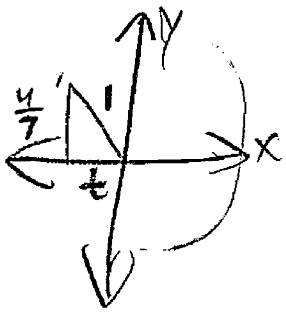
$= \dfrac{48.5976025 + 78.86622498}{2}$
$= 63.73209261$

Explain its meaning in the given context.

63.7 is the average monthly rate, this means the temperature will change 63.7 degrees between these months

Score 0: The student incorrectly calculated the rate of change and gave an incorrect explanation.

31 Point $M\left(t, \frac{4}{7}\right)$ is located in the second quadrant on the unit circle. Determine the exact value of t.



$$1^2 - \left(\frac{4}{7}\right)^2 = t^2$$

$$1 - \frac{16}{49} = t^2$$

$$\sqrt{\frac{33}{49}} = \sqrt{t^2}$$

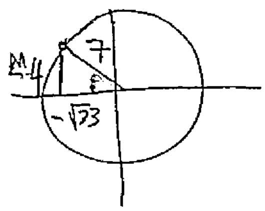
$$t = \pm\frac{\sqrt{33}}{7}$$

$$\boxed{t = -\frac{\sqrt{33}}{7}}$$

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

Question 31

31 Point $M\left(t, \frac{4}{7}\right)$ is located in the second quadrant on the unit circle. Determine the exact value of t.



$t = \cos\theta$

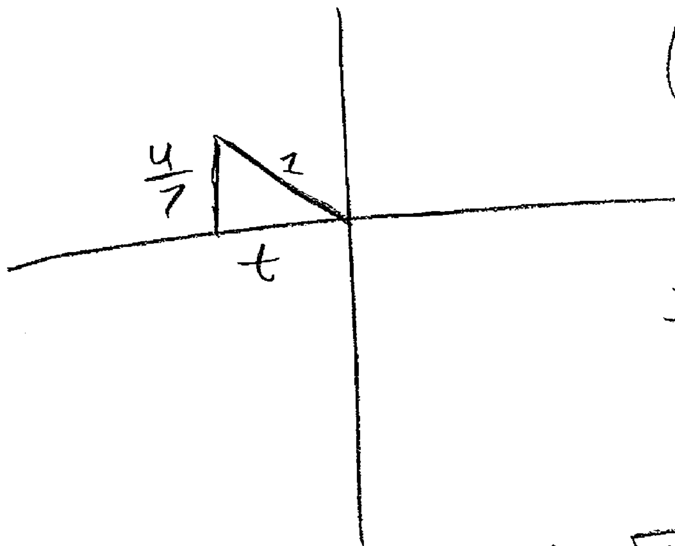
$\boxed{t = \frac{-\sqrt{33}}{7}}$

$\left(t, \frac{4}{7}\right)$ — sin x

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

Question 31

31 Point $M\left(t, \frac{4}{7}\right)$ is located in the second quadrant on the unit circle. Determine the exact value of t.



$$\left(\frac{4}{7}\right)^2 + (t)^2 = 1^2$$

$$\frac{16}{49} + (t)^2 = 1$$

$$-\frac{16}{49} \qquad -\frac{16}{49}$$

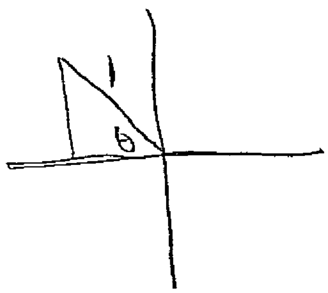
$$\sqrt{t^2} = \sqrt{\frac{33}{49}}$$

$$t = \sqrt{\frac{33}{49}} \qquad \frac{\sqrt{33}}{\sqrt{49}} \qquad \frac{\sqrt{33}}{7}$$

$$\boxed{t = \frac{\sqrt{33}}{7}}$$

Score 1: The student did not determine the correct sign of the value.

31 Point $M\left(t, \frac{4}{7}\right)$ is located in the second quadrant on the unit circle. Determine the exact value of t.



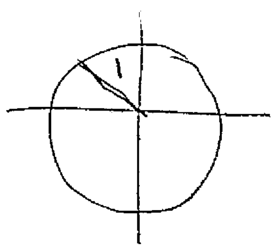
$(\cos\theta, \sin\theta) = \left(t, \frac{4}{7}\right)$

$\sin\theta = \frac{4}{7}$

$\theta = 34.85^\circ$

$\cos 34.85' = t$

$\boxed{t = -.82}$

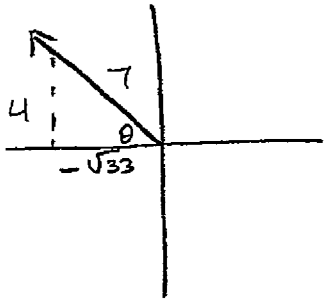


Score 1: The student did not determine the exact value.

Question 31

31 Point $M\left(t, \frac{4}{7}\right)$ is located in the second quadrant on the unit circle. Determine the exact value of t.

sin



$4^2 + b^2 = 7^2$

$16 + b^2 = 49$

$b^2 = 33$

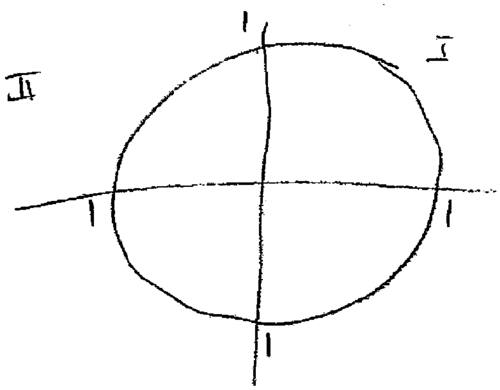
$b = \sqrt{33}$

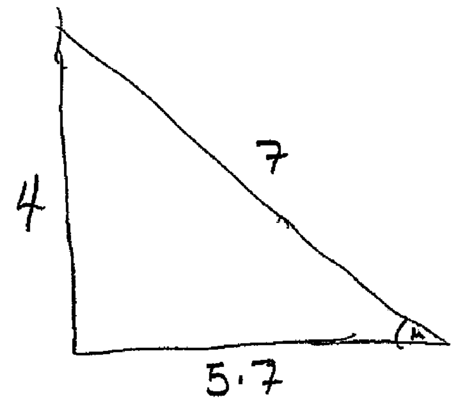
$\boxed{t = -\sqrt{33}}$

Score 1: The student made made an error by not considering the unit circle.

Question 31

31 Point $M\left(t, \frac{4}{7}\right)$ is located in the second quadrant on the unit circle. Determine the exact value of t.





$\cos(M) = t$

$\sin(M) = \frac{4}{7}$

$\cos(M) = \frac{5.7}{7}$

$7^2 = 4^2 + b^2$

$49 = 16 + b^2$

$\sqrt{33} = \sqrt{b^2}$

$5.744562647 = b$

$T = \frac{5.7}{7}$

Score 0: The student made multiple errors.

Question 31

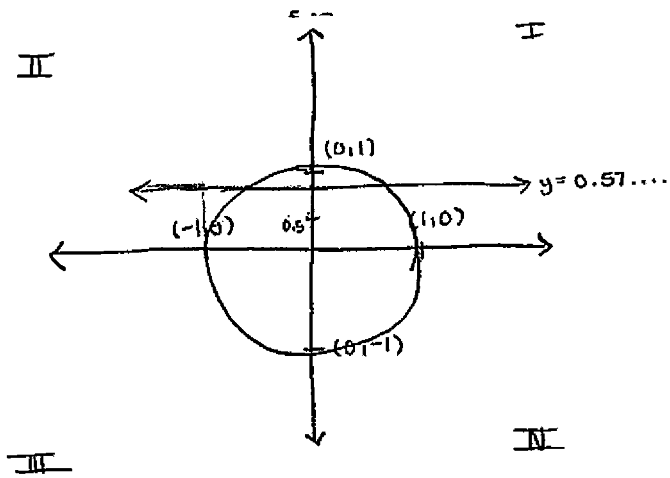
31 Point $M\left(t, \frac{4}{7}\right)$ is located in the second quadrant on the unit circle. Determine the exact value of t.

x y $\rightarrow$ 0,57....

• t must be negative

(−x, y)

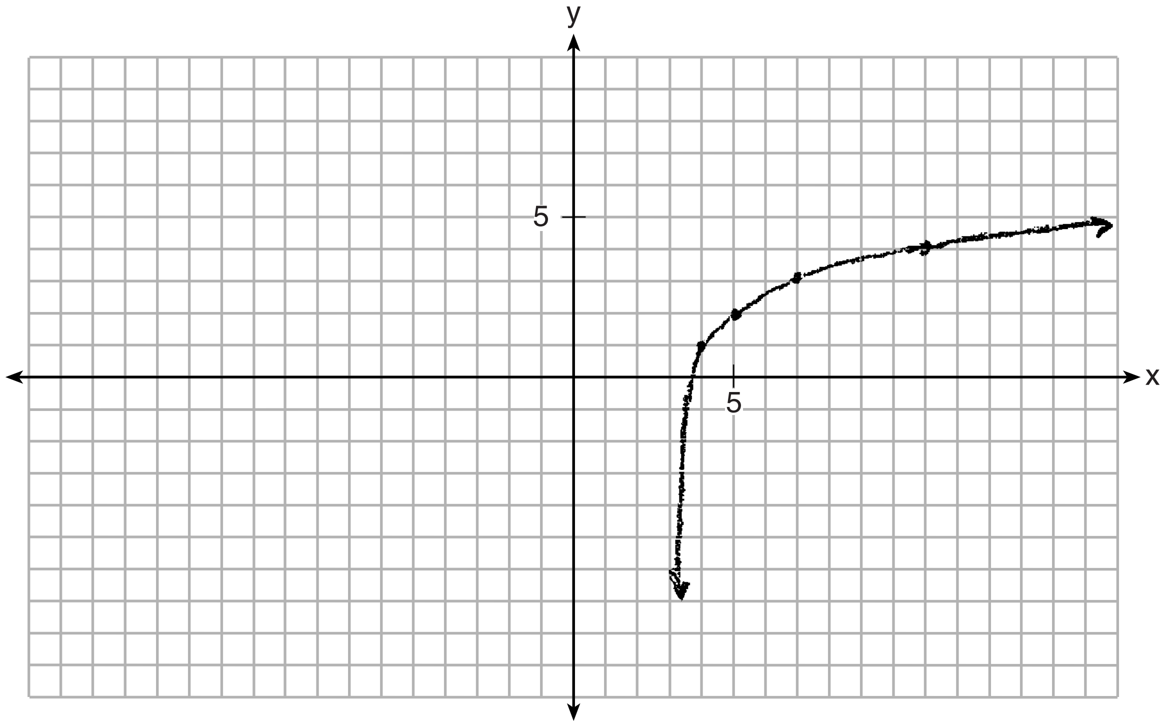
$\left(-x, \frac{4}{7}\right)$



Score 0: The student gave a completely irrelevant response.

Question 32

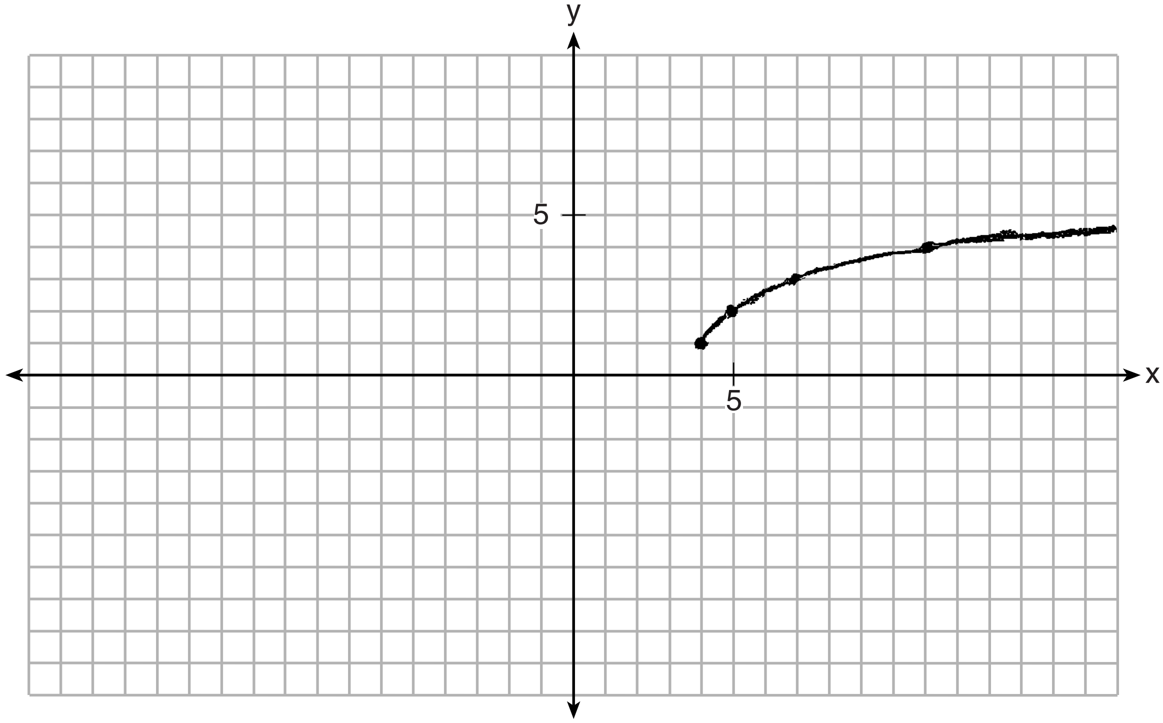
32 On the grid below, graph the function $y = \log_2(x - 3) + 1$



x	y
4	1
5	2
7	3
11	4

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

32 On the grid below, graph the function $y = \log_2(x - 3) + 1$

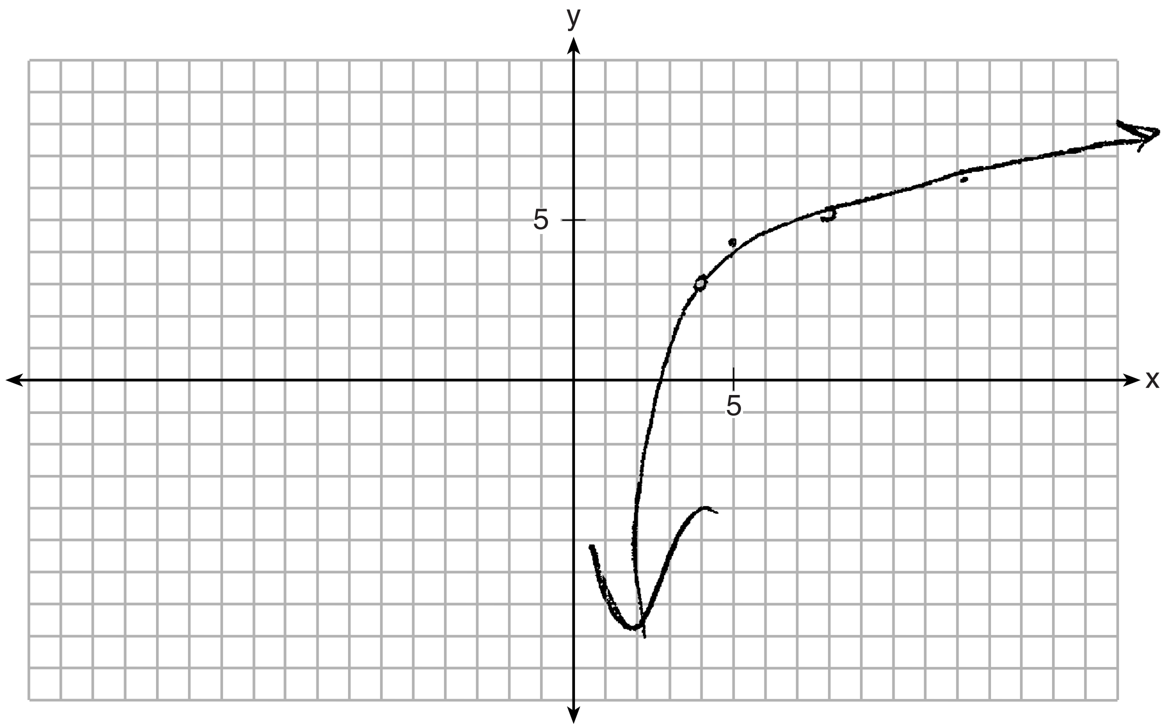


x	y
4	1
5	2
7	3
11	4

Score 1: The student made an error graphing the end behavior as $x \to 3$.

Question 32

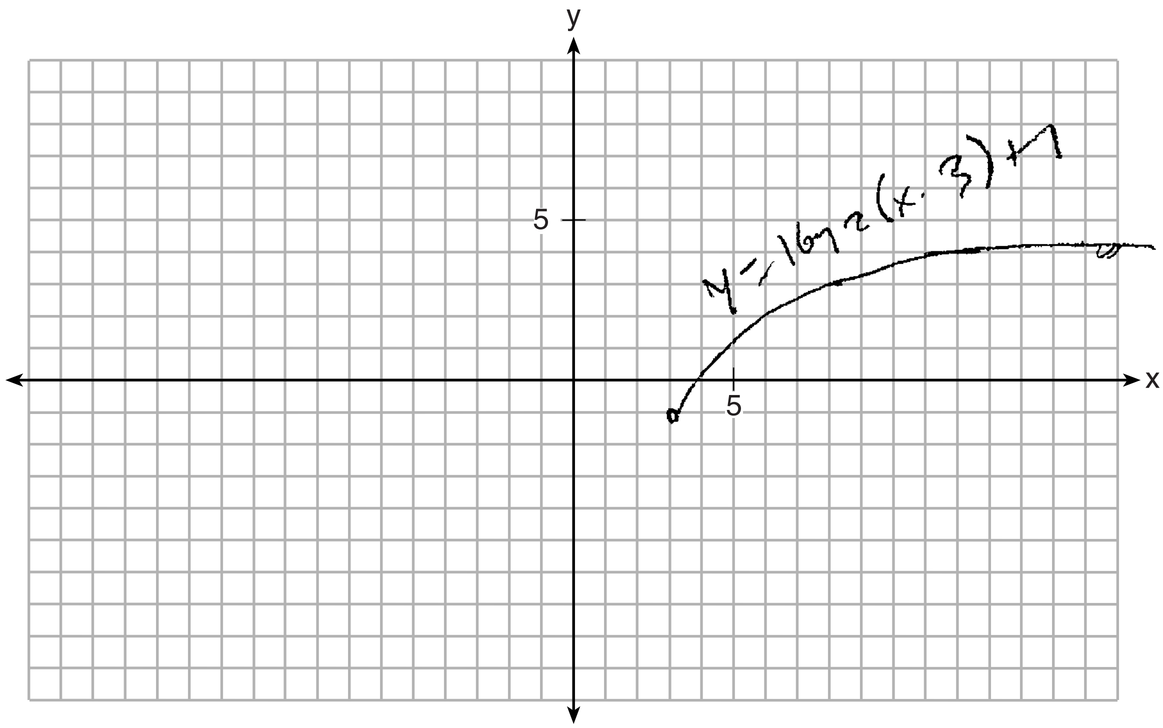
32 On the grid below, graph the function $y = \log_2(x - 3) + 1$



Score 0: The student made multiple graphing errors.

Question 32

32 On the grid below, graph the function $y = \log_2(x - 3) + 1$



Score 0: The student made multiple graphing errors.

Question 33

33 Solve the following system of equations algebraically for all values of a, b, and c.

$$a + 4b + 6c = 23$$
$$a + 2b + c = 2$$
$$6b + 2c = a + 14 \rightarrow \quad -a + 6b + 2c = 14$$

$6b + 2c = a + 14$
$a + 4b + 6c = 23$
$-a + 6b + 2c = 14$
$10b + 8c = 37$

$6b + 2c = a + 14$
$a + 2b + c = 2$
$-a + 6b + 2c = 14$
$8b + 3c = 16$

$3(10b + 8c = 37)$
$-8(8b + 3c = 16)$

$30b + 24c = 111$
$-64b + 24c = -128$

$-34b = -17$
$\frac{-34b}{-34} = \frac{-17}{-34}$
$b = 0.5$

$8b + 3c = 16$
$8(0.5) + 3c = 16$
$4 + 3c = 16$
$-4 \quad -4$
$3c = 12$
$\frac{3c}{3} = \frac{12}{3}$
$c = 4$

$a + 2b + c = 2$
$a + 2(0.5) + 4 = 2$
$a + 1 + 4 = 2$
$a + 5 = 2$
$-5 \quad -5$
$a = -3$

$a + 4b + 6c = 23$
$-3 + 4(0.5) + 6(4) = 23$
$-3 + 2 + 24 = 23$

$6b + 2c = a + 14$
$6(0.5) + 2(4) = -3 + 14$
$3 + 8 = 11$

$$\boxed{\begin{aligned} a &= -3 \\ b &= 0.5 \\ c &= 4 \end{aligned}}$$

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

Question 33

33 Solve the following system of equations algebraically for all values of a, b, and c.

$$\cancel{a} + 4b + 6c = 23$$
$$\cancel{a} + 2b + c = 2$$
$$-a + 6b + 2c = \cancel{a} + 14$$

$a = -3$
$b = 0.5$
$c = 4$

Check
$a + 2b + c = 2$
$-3 + 2(.5) + 4 = 2$
$2 = 2$

$5(8b + 3c = 16)$
$3(-2b - 5c = -21)$

$-17c = \frac{-68}{-17}$
$c = 4$

$40b + \cancel{15c} = 80$
$-6b - \cancel{15c} = -63$
$34b = \frac{17}{34} =$
$b = 0.5$

$a + 2(.5) + 4 = 2$
$a = -3$

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

Question 33

33 Solve the following system of equations algebraically for all values of a, b, and c.

$$1)\ a + 4b + 6c = 23$$
$$2)\ a + 2b + c = 2$$
$$6b + 2c = a + 14$$
$$3)\ -a + 6b + 2c = 14$$

$-\cancel{a} + 6b + 2c = 14$
$\cancel{a} + 2b + c = 2$
$5)\ 8b + 3c = 16$

$\cancel{a} + 4b + 6c = 23$
$-\cancel{a} - 2b - c = -2$
$6)\ 2b + 5c = 21$

$-4(2b + 5c = 21)$
$-8b - 20c = -84$

$\cancel{8b} + 3c = 16$
$-\cancel{8b} - 20c = -84$
$\frac{-17c}{-17} = \frac{-68}{-17}$
$c = 4$

$2b + 5c = 21$
$2b + 5(4) = 21$
$2b + 20 = 21$
$2b = 1$
$b = 2$

$a + 2b + c = 2$
$a + 2(2) + 4 = 2$
$a + 4 + 4 = 2$
$a + 8 = 2$
$-8 \quad -8$
$a = -6$

Score 3: The student made a mistake when evaluating b.

Question 33

33 Solve the following system of equations algebraically for all values of a, b, and c.

$$a + 4b + 6c = 23$$
$$-a + 2b + c = 2$$
$$-a + 6b + 2c = \cancel{a} + 14$$

$-5(2b + 5c = 21)$

$10b + 8c = 36$

$-10b - 25c = -105$

$10b + 8c = 36$

$-17c = -69$

$c = 4$

$10b + 8(4) = 36$

$10b = 4$

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

$a + 4(\frac{2}{5}) + 6(4) = 23$

$a + 4(\frac{2}{5}) = -1$

$a = -2.6$

Score 2: The student made two computational errors.

33 Solve the following system of equations algebraically for all values of a, b, and c.

$$\text{①}\ a + 4b + 6c = 23$$
$$\text{②}\ a + 2b + c = 2$$
$$\text{③}\ 6b + 2c = a + 14 \rightarrow -a+6b+2c=14$$

① add eqn 1 and eqn 3

$\cancel{a}+4b+6c=23$
$\cancel{-a}+6b+2c=14$
$10b+8c=37$

② add eqn 3 and eqn 2

$\cancel{-a}+6b+2c=14$
$\cancel{a}+2b+c=2$
$8b+3c=16$

$(10b+8c=37)\cdot{-8} \rightarrow -80b-64c=296$
$(8b+3c=16)\cdot 10 \rightarrow 80b+30c=160$

$\cancel{-80b}+64c=296$
$\cancel{80b}+30c=160$
$-34c=456$
$\frac{-34c}{-34}=\frac{456}{-34}$
$c=-13.4$

$10b+8(-13.4)=37$
$10b+-107.2$
$10b=144.2$
$b=14.42$

$a+2b+c=2$
$a+2(14.42)-13.4=2$
$a+15.44=2$
$a=-13.44$

Score 2: The student made one computational error and one rounding error.

Question 33

33 Solve the following system of equations algebraically for all values of a, b, and c.

$$L_1 \quad a + 4b + 6c = 23$$
$$L_2 \quad a + 2b + c = 2$$
$$L_3 \quad 6b + 2c = a + 14$$
$$-a+6b+2c=14$$

① $L_1 + (L_2)-1$

$+ \quad a+4b+6c=23$
$-1(a+2b+c=2)$

$\cancel{a}+4b+6c=23$
$-\cancel{a}-2b-c=-2$

$L_4: 2b+5c=21$

② L_1+L_3

$+ \quad \cancel{a}+4b+6c=23$
$-\cancel{a}+6b+2c=14$

$L_5: 10b+8c=37$

③ $5(L_4)+L_5$

Score 1: The student showed correct work to eliminate one variable.

Question 33

33 Solve the following system of equations algebraically for all values of a, b, and c.

$$a + 4b + 6c = 23$$
$$a + 2b + c = 2$$
$$6b + 2c = a + 14$$

① $a + 4b + 6c = 23$
$-$ $a + 2b + c = 2$

$2b + 5c = 21$

② $a + 2b + c = 2$
$+$ $-a + 6b + 2c = 14$

$8b + 3c = 16$

③ $2b + 5c = 21\ (4)$
$8b + 3c = 16$

$8b + 20c = 84$
$-$ $8b + 3c = 16$

$17c = 100$

$6b + 2c = a + 14$
$-a$
$-a + 6b + 2c = 14$

Score 1: The student showed correct work to eliminate one variable.

Question 33

33 Solve the following system of equations algebraically for all values of a, b, and c.

$$a + 4b + 6c = 23$$
$$a + 2b + c = 2$$
$$6b + 2c = a + 14$$

$-1(a+4b+6c=23)$

$1(a+2b+c=2)$

$-\cancel{1a}-4b-6c=-23$

$+\cancel{1a}+2b+c=2$

$\boxed{-2b-5c=-21}$

$-6(a+4b+6c=23)$

$1(6b+2c=a+14)$

$-\cancel{6a}-24b-36c=-183$

$\cancel{6b}+2c=a+14$

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

34 Given $a(x) = x^4 + 2x^3 + 4x - 10$ and $b(x) = x + 2$, determine $\dfrac{a(x)}{b(x)}$ in the form $q(x) + \dfrac{r(x)}{b(x)}$.

$$
\begin{array}{r}
x^3 + 4 \\
x+2 \overline{\big) x^4 + 2x^3 + 4x - 10} \\
x^4 \mp 2x^3 \\
\hline
0 + \cancel{4x} - 10 \\
-\cancel{4x} \mp 8 \\
\hline
-18
\end{array}
$$

$$\boxed{x^3 + 4 + \frac{-18}{x+2}}$$

Is $b(x)$ a factor of $a(x)$? Explain.

no, because when I divided it, the remainder was -18, not 0.

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

Question 34

34 Given $a(x) = x^4 + 2x^3 + 4x - 10$ and $b(x) = x + 2$, determine $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$.

$a(x) = x^4 + 2x^3 + 4x - 10 \Rightarrow \frac{a(x)}{b(x)}$

$b(x) = x + 2$

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

$x+2 \overline{) x^4 + 2x^3 + 4x - 10}$

$-\underline{x^4 + 2x^3}$

$0 + 4x$

$-\underline{4x + 8}$

$8 - 10 \Rightarrow$

remander

-2

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

Is $b(x)$ a factor of $a(x)$? Explain.

(bx) is not a factor of a(x) because when a(x) is divided by b(x) a remander is present.

Score 3: The student made an error in calculating the remainder.

Question 34

34 Given $a(x) = x^4 + 2x^3 + 4x - 10$ and $b(x) = x + 2$, determine $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$.

$$
\begin{array}{r|l}
 & x^3 \quad\quad\quad\quad +4 \\
x+2 & x^4+2x^3+0x^2+4x-10 \\
 & -(x^4+2x^3) \quad -(4x+8) \\
 & 0 \quad 0 \quad\quad\quad\quad -18
\end{array}
$$

$$\frac{a(x)}{b(x)} = x^3 + 4 + \frac{-18}{x+2}$$

Is $b(x)$ a factor of $a(x)$? Explain.

The remainder is not 0

Score 3: The student did not indicate that $b(x)$ is not a factor.

Question 34

34 Given $a(x) = x^4 + 2x^3 + 4x - 10$ and $b(x) = x + 2$, determine $\dfrac{a(x)}{b(x)}$ in the form $q(x) + \dfrac{r(x)}{b(x)}$.

$$\begin{array}{r} x^3 + 4 \\ x+2 \overline{\big) x^4 + 2x^3 + 4x - 10} \\ -\left(x^4 + 2x^3\right) \\ \hline +4x - 10 \\ -\left(4x + 8\right) \\ \hline -18 \end{array}$$

$$\frac{(x+2)(x^3+4) - 18}{x+2}$$

$$= x^3 + 4 - \frac{18}{x+2}.$$

Is $b(x)$ a factor of $a(x)$? Explain.

No

because of $\dfrac{-18}{x+2}$

Score 3: The student provided an incomplete explanation.

Question 34

34 Given $a(x) = x^4 + 2x^3 + 4x - 10$ and $b(x) = x + 2$, determine $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$.

$$\frac{x^4+2x^3+4x-10}{x+2}$$

$$\frac{x^3(\cancel{x+2})+2(2x-5)}{\cancel{x+2}}$$

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

$$x^3+4x-10$$

Is $b(x)$ a factor of $a(x)$? Explain.

b(x) isn't a factor because when you graph a(x), the zeros aren't at -2. x+2 means that a zero would go through the x-axis at -2.

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

Question 34

34 Given $a(x) = x^4 + 2x^3 + 4x - 10$ and $b(x) = x + 2$, determine $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$.

$$
\begin{array}{r}
x^3 \qquad 0x + 4 \\
x+2 \,\big)\, x^4 + 2x^3 + 0x^2 + 4x - 10 \\
-\left(\cancel{x^4} + \cancel{2x^3}\right) \qquad\qquad\qquad \\
\cancel{0x^2} + 4x \qquad\;\; \\
-\left(\cancel{0x^2} + 0x\right) \qquad\;\; \\
4\cancel{x} - 10 \\
-\left(4\cancel{x} + 6\right) \\
-16
\end{array}
$$

Is $b(x)$ a factor of $a(x)$? Explain.

no, because the remainder is not 0.

Score 2: The student made a computational error and did not state the answer in the correct form.

34 Given $a(x) = x^4 + 2x^3 + 4x - 10$ and $b(x) = x + 2$, determine $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$.

$$\frac{x^4 + 2x^3 + 4x - 10}{x + 2}$$

$$\begin{array}{r|rrrrr} -2 & 1 & 2 & 0 & 4 & -10 \\ \hline & 1 & 0 & 0 & 4 & \boxed{-18} \end{array}$$

$x^3 + 4 \rightarrow \boxed{x^3 + 4 + \frac{-18}{2}}$

Remainder: -18

Is $b(x)$ a factor of $a(x)$? Explain.

Score 1: The student did not state $b(x)$ correctly.

34 Given $a(x) = x^4 + 2x^3 + 4x - 10$ and $b(x) = x + 2$, determine $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$.

$$\frac{x^4 + 2x^3 + 4x - 10}{x+2}$$

$$\frac{x^3\cancel{(x+2)} + 2(x-5)}{\cancel{x+2}}$$

$$x^3 + 2(x-5)$$
$$x^3 + 2x - 10$$

Is $b(x)$ a factor of $a(x)$? Explain.

Yes it is because when $x^4 + 2x^3$ is factored the result is $x^3(x+2)$ and $b(x) = x+2$.

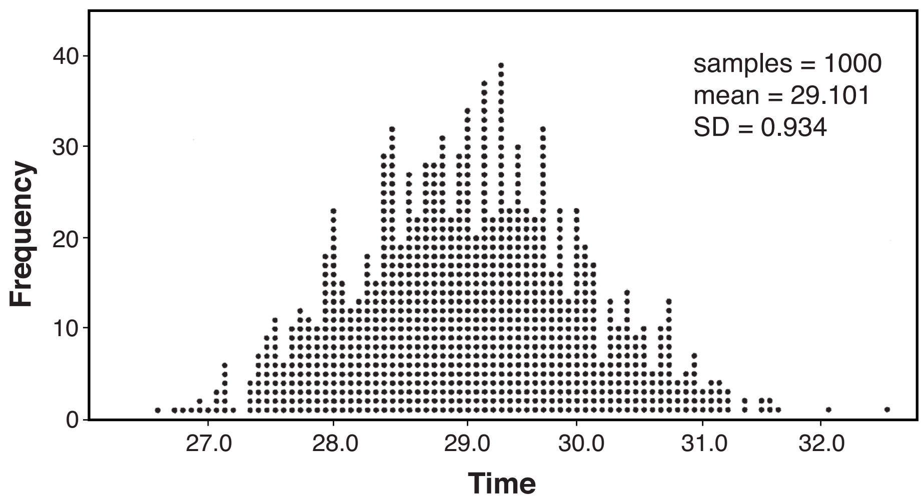
Score 0: The student did not show enough correct work to receive any credit.

Question 35

35 A radio station claims to its advertisers that the mean number of minutes commuters listen to the station is 30. The station conducted a survey of 500 of their listeners who commute. The sample statistics are shown below.

$\bar{x}$	29.11
s_x	20.718

A simulation was run 1000 times based upon the results of the survey. The results of the simulation appear below.



Based on the simulation results, is the claim that commuters listen to the station on average 30 minutes plausible? Explain your response including an interval containing the middle 95% of the data, rounded to the *nearest hundredth*.

$29.101 \pm 2(.934)$

$\boxed{(27.23, 30.97)}$

Yes, 30 falls within the interval, so the claim is plausible.

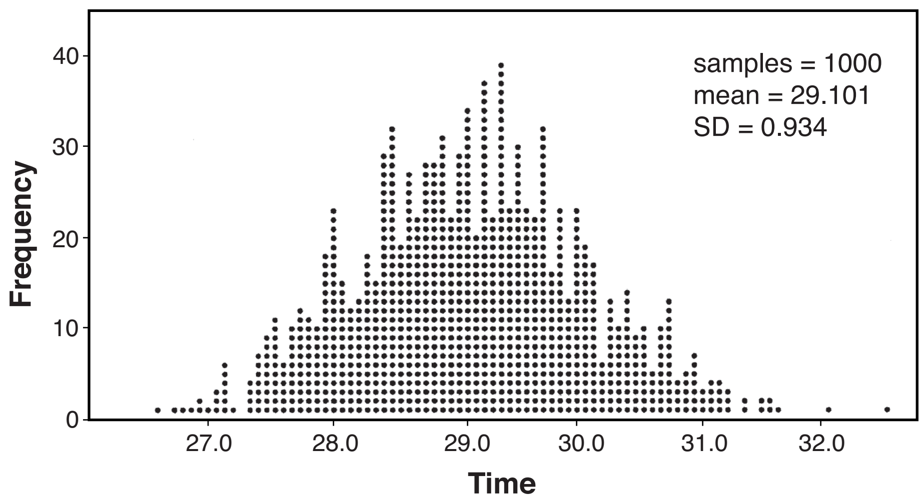
Score 4: The student gave a complete and correct response.

Question 35

35 A radio station claims to its advertisers that the mean number of minutes commuters listen to the station is 30. The station conducted a survey of 500 of their listeners who commute. The sample statistics are shown below.

$\bar{x}$	29.11
s_x	20.718

A simulation was run 1000 times based upon the results of the survey. The results of the simulation appear below.



Based on the simulation results, is the claim that commuters listen to the station on average 30 minutes plausible? Explain your response including an interval containing the middle 95% of the data, rounded to the *nearest hundredth*.

27.233 28.167 29.101 30.035 30.969

.934 .934 .934 .934

30.0

30 minutes is plausible because it falls withing the interval 27.233 – 30.969.

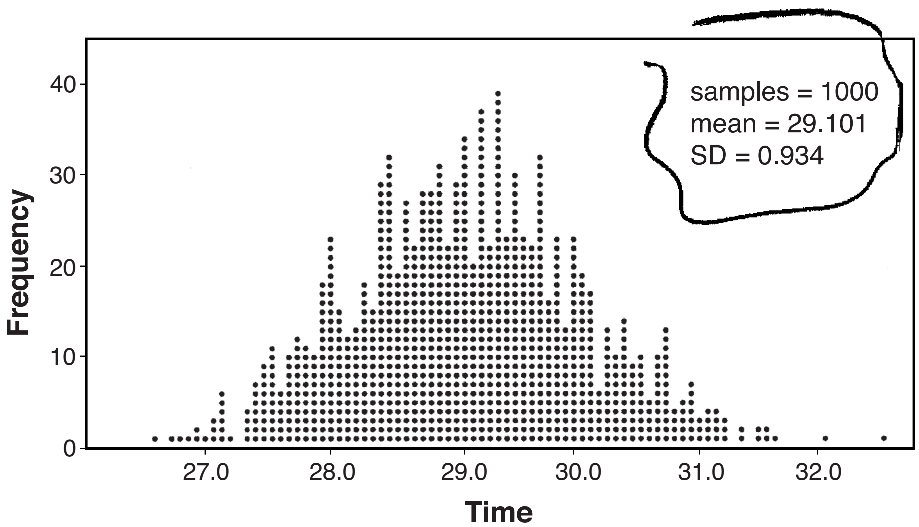
Score 3: The student made a rounding error.

Question 35

35 A radio station claims to its advertisers that the mean number of minutes commuters listen to the station is 30. The station conducted a survey of 500 of their listeners who commute. The sample statistics are shown below.

$\bar{x}$	29.11
s_x	20.718

A simulation was run 1000 times based upon the results of the survey. The results of the simulation appear below.



Based on the simulation results, is the claim that commuters listen to the station on average 30 minutes plausible? Explain your response including an interval containing the middle 95% of the data, rounded to the *nearest hundredth*.

To say the average is 30 would be appropriate because the margin of error is 1.87 and the mean is 29.101 therefore 30 is not inappropriate and it could be possible. (29.101 + 1.868 = 30.969)

M.O: 2 - 2σ
1.868
could occur

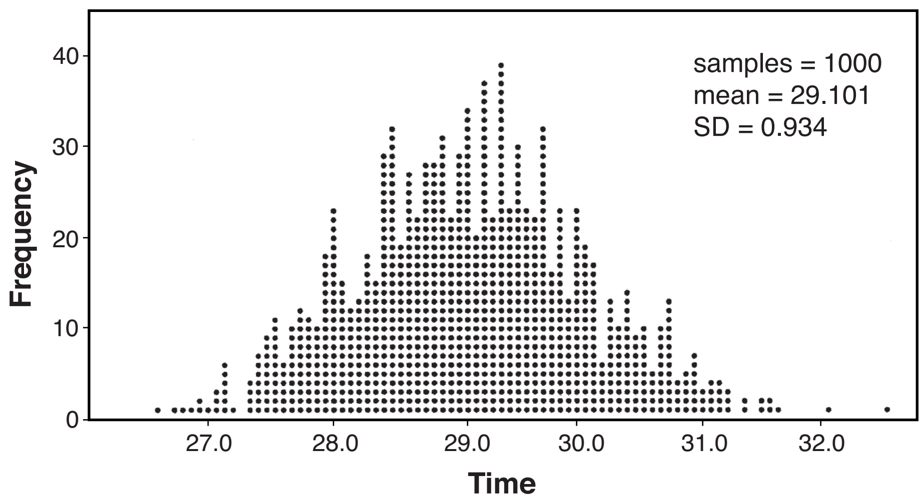
Score 2: The student did not round correctly and provided an incomplete interval.

Question 35

35 A radio station claims to its advertisers that the mean number of minutes commuters listen to the station is 30. The station conducted a survey of 500 of their listeners who commute. The sample statistics are shown below.

$\bar{x}$	29.11
s_x	20.718

A simulation was run 1000 times based upon the results of the survey. The results of the simulation appear below.



Based on the simulation results, is the claim that commuters listen to the station on average 30 minutes plausible? Explain your response including an interval containing the middle 95% of the data, rounded to the *nearest hundredth*.

$27.233 \xleftarrow{-2\sigma} 29.101 \xrightarrow{+2\sigma} 30.969$

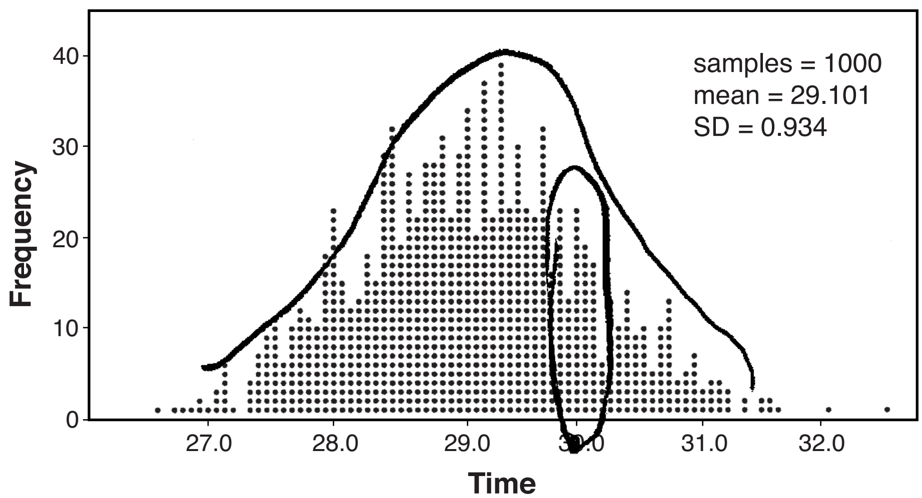
Score 1: The student didn't round the interval correctly.

Question 35

35 A radio station claims to its advertisers that the mean number of minutes commuters listen to the station is 30. The station conducted a survey of 500 of their listeners who commute. The sample statistics are shown below.

$\bar{x}$	29.11
s_x	20.718

A simulation was run 1000 times based upon the results of the survey. The results of the simulation appear below.



Based on the simulation results, is the claim that commuters listen to the station on average 30 minutes plausible? Explain your response including an interval containing the middle 95% of the data, rounded to the *nearest hundredth*.

It is because its within the interval 95% percentile.

Score 0: The student did not provide an interval and provided an irrelevant explanation.

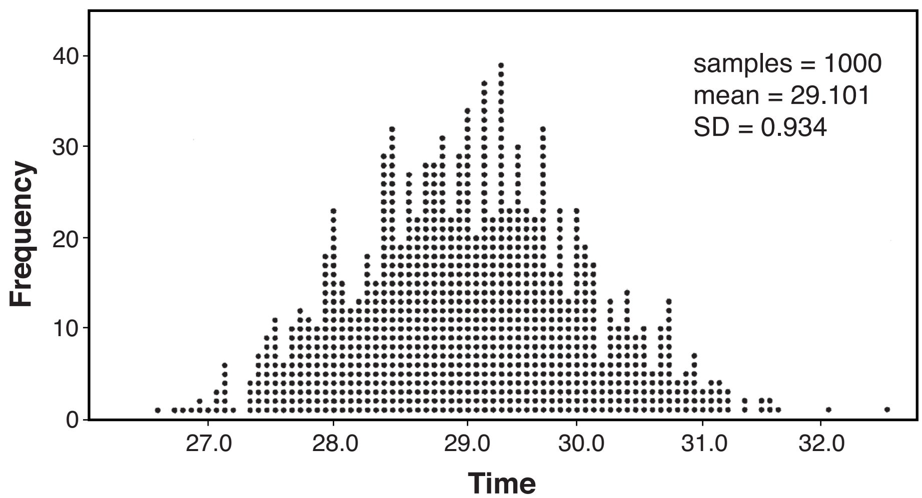
Question 35

35 A radio station claims to its advertisers that the mean number of minutes commuters listen to the station is 30. The station conducted a survey of 500 of their listeners who commute. The sample statistics are shown below.

Mean = 30

$\bar{x}$	29.11
s_x	20.718

A simulation was run 1000 times based upon the results of the survey. The results of the simulation appear below.



Mean = 29.1

Based on the simulation results, is the claim that commuters listen to the station on average 30 minutes plausible? Explain your response including an interval containing the middle 95% of the data, rounded to the *nearest hundredth*.

NO, the middle number is 30/29.1 so there for there is no majority listening over 30 minutes. Most listened for under 30.

Score 0: The student provided a completely incoherent response.

Question 36

36 Solve the given equation algebraically for all values of x.

$$3\sqrt{x} - 2x = -5$$

$3\sqrt{x} = -5+2x$

$9x = (-5+2x)^2$

$9x = 25 - 20x + 4x^2$

$9x - 25 + 20x - 4x^2 = 0$

$29x - 25 - 4x^2 = 0$

$-4x^2 + 29x - 25 = 0$

$4x^2 - 29x + 25 = 0$

$x = \dfrac{-(-29) \pm \sqrt{(-29)^2 - 4 \times 4 \times 25}}{2 \times 4}$

$x = \dfrac{29 \pm \sqrt{841 - 400}}{8}$

$x = \dfrac{29 \pm \sqrt{441}}{8}$

$x = \dfrac{29 \pm 21}{8}$

$x = \dfrac{25}{4}$ $\quad x = 1$

$3\sqrt{\dfrac{25}{4}} - 2 \times \dfrac{25}{4} = -5$

$3\sqrt{1} - 2 \times 1 = -5$

$-5 = -5$

$1 \neq -5$

$x = \dfrac{25}{4}$

$x \neq 1$

$\boxed{x = 6.25}$

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

Question 36

36 Solve the given equation algebraically for all values of x.

$$3\sqrt{x} - 2x = -5$$

$4x - 25 = 0$
$+25 \quad +25$
$\frac{4x}{4} = \frac{25}{4}$
$\boxed{x = 6.25}$

$x - 1 = 0$
$+1 \quad +1$
$\boxed{\cancel{x = 1}}$
reject

$\sqrt{9x} - 2x = -5 + 2x$
$+2x$
$(\sqrt{9x})^2 (-5 + 2x)^2$

$9x = (-5 + 2x)(-5 + 2x)$

$9x = 25 - 10x + 4x^2$
$-10x$

$9x = 4x^2 - 20x + 25$
$-9x \qquad -9x$

$0 = 4x^2 - 29x + 25$

$0 = 4x^2 - 4x - 25x + 25$

$0 = 4x(x - 1) - 25(x - 1)$
$0 = (4x - 25)(x - 1)$

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

Question 36

36 Solve the given equation algebraically for all values of x.

$$3\sqrt{x} - 2x = -5$$

$$3\sqrt{x} = 2x - 5$$

$$\sqrt{x} = \frac{2x-5}{3}$$

$$x = \frac{4x^2 - 20x + 25}{9}$$

$$9x = 4x^2 - 20x + 25$$

$$0 = 4x^2 - 29x + 25$$

4   -1

4   -25

$$(x-1)(4x-25)$$

$$x_1 = 1 \qquad x_2 = \frac{25}{4}$$

$$x_1 = 1 \qquad x_2 = 6.25$$

Score 3: The student did not reject one solution.

Question 36

36 Solve the given equation algebraically for all values of x.

$$3\sqrt{x} - 2x = -5$$

$$3\sqrt{x} - 2x = -5$$

$$\sqrt{x} = \frac{-5+2x}{3}$$

$$x = \left(\frac{-5+2x}{3}\right)^2$$

$$x = \frac{25+4x^2}{9}$$

$$9x = 25 + 4x^2$$

$$0 = 4x^2 - 9x + 25$$

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

$$x = \frac{-(-9) \pm \sqrt{(-9)^2 - 4(4)(25)}}{2(4)}$$

$$= \frac{9 \pm \sqrt{81 - 400}}{8}$$

$$= \frac{9 \pm \sqrt{-319}}{8}$$

No solution

Score 2: The student did not correctly square the binomial $-5 + 2x$.

Question 36

36 Solve the given equation algebraically for all values of x.

$$3\sqrt{x} - 2x = -5$$

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

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

$(3\sqrt{x})^2 = (2x-5)^2$

$9x = 4x^2-20x+25$

$0 = 4x^2-29x+25$

$x = \frac{-(-29)\pm\sqrt{-29^2-4(4(25))}}{2(4)}$

$x = \frac{29\pm\sqrt{441}}{4}$

$x = \frac{29\pm 21}{4}$

$x = 12.5$

$x = 2$

Score 2: The student correctly stated the quadratic equation, but made multiple errors after that.

36 Solve the given equation algebraically for all values of x.

$$3\sqrt{x} - 2x = -5$$

$+5 \quad +5$

$(\sqrt{9x} - 2x + 5 = 0)^2$

$\cancel{\angle 25}$

$9x - 4x^2 + 25 = 0$

$\cancel{(9x \quad)(9x \quad) = 0}$

$-4x^2 + 9x + 25 = 0$

$4x^2 - 9x - 25 = 0$

$\cancel{100}$

$\cancel{(4x \quad)(4x \quad) = 0}$

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

$$\frac{9 \pm \sqrt{81 - 4(4)(-25)}}{8}$$

$$\frac{9 \pm \sqrt{81 - 400}}{8}$$

$$\frac{9 \pm \sqrt{481}}{8}$$

$$\frac{9 + \sqrt{481}}{8}$$

or

$$\frac{9 - \sqrt{481}}{8}$$

Score 1: The student incorrectly squared a trinomial and didn't reject the answers.

Question 36

36 Solve the given equation algebraically for all values of x.

$$3\sqrt{x} - 2x = -5$$

$$3\sqrt{x} - \cancel{2x} = -5$$

$$+\cancel{2x} \quad +2x$$

$$(3\sqrt{x}) = (-5 + 2x)$$

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

$$\boxed{x = \frac{-5+2x}{3}}$$

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

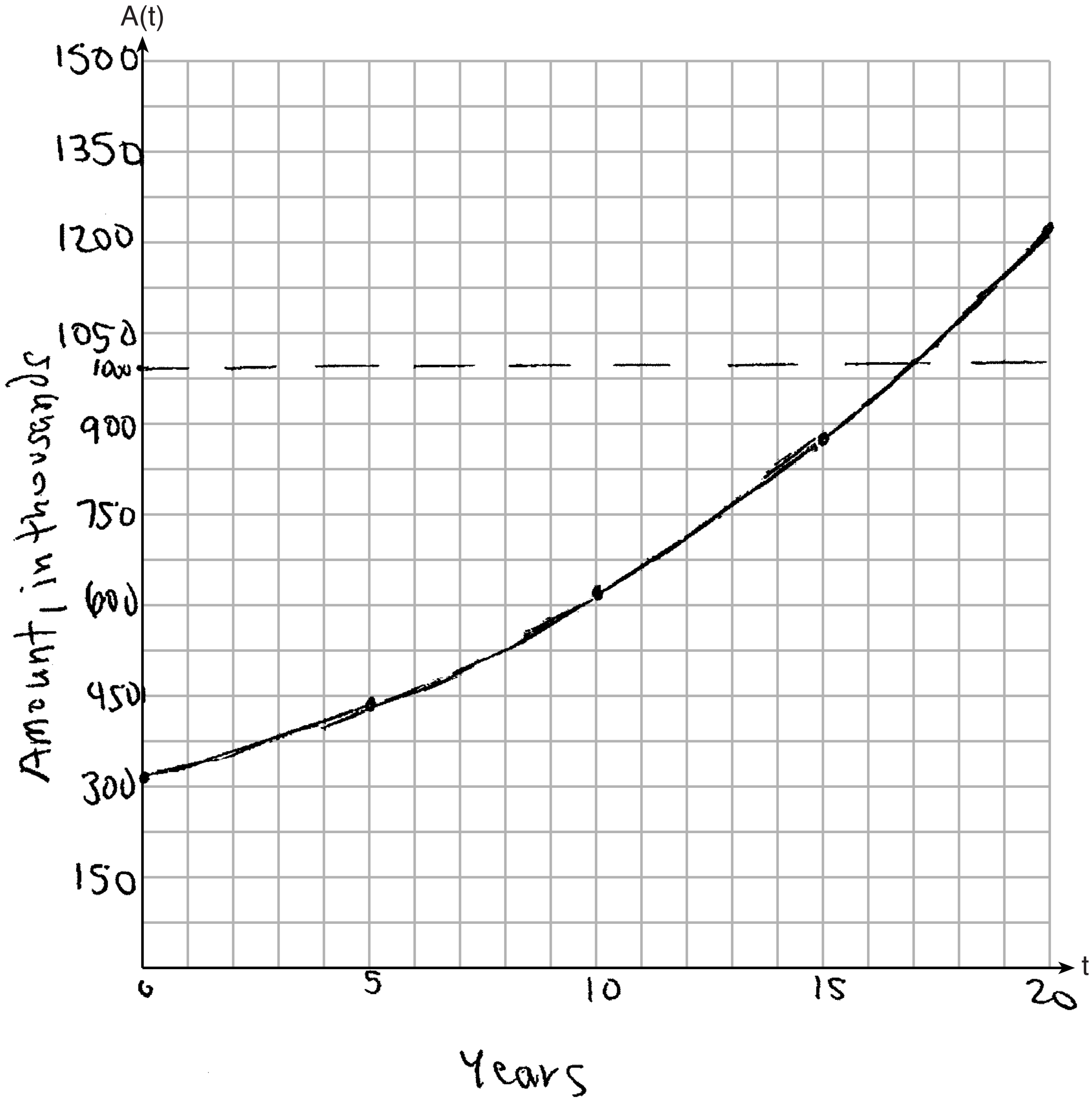
Question 37

37 Tony is evaluating his retirement savings. He currently has \$318,000 in his account, which earns an interest rate of 7% compounded annually. He wants to determine how much he will have in the account in the future, even if he makes no additional contributions to the account.

Write a function, $A(t)$, to represent the amount of money that will be in his account in t years.

$$A(t) = 318000(1.07)^t$$

Graph $A(t)$ where $0 \leq t \leq 20$ on the set of axes below.



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

Tony's goal is to save $1,000,000. Determine algebraically, to the *nearest year*, how many years it will take for him to achieve his goal.

$$1000000 = 318000(1.07)^t$$

$$\frac{800}{159} = 1.07^t$$

$$\ln\left(\frac{500}{159}\right) = \ln 1.07^t$$

$$\frac{\ln\left(\frac{500}{159}\right)}{\ln 1.07} = \frac{t \ln 1.07}{\ln 1.07}$$

$$16.93\ldots = t$$

$$\boxed{17 \text{ years}}$$

Explain how your graph of $A(t)$ confirms your answer.

The graph of A(t) crosses the line y = 1000 (really 1,000,000) where x ≈ 17.

Question 37

37 Tony is evaluating his retirement savings. He currently has $318,000 in his account, which earns an interest rate of 7% compounded annually. He wants to determine how much he will have in the account in the future, even if he makes no additional contributions to the account.

a_1

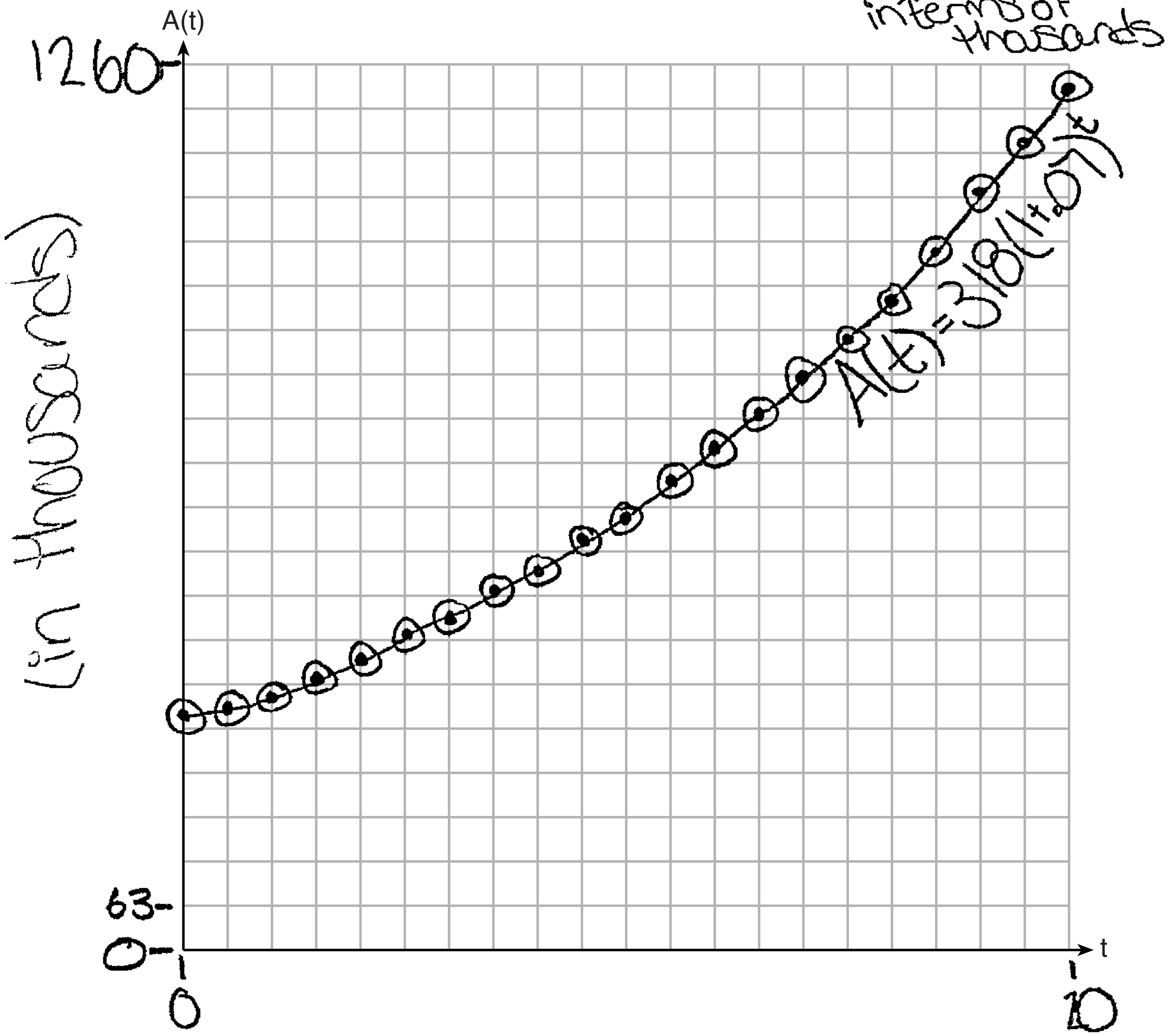
Write a function, $A(t)$, to represent the amount of money that will be in his account in t years.

~~$A(t)=318{,}000(1+.07)^t$~~

$A(t)=318(1+.07)^t$

in terms of thousands

Graph $A(t)$ where $0 \leq t \leq 20$ on the set of axes below.



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

Tony's goal is to save $1,000,000. Determine algebraically, to the *nearest year*, how many years it will take for him to achieve his goal.

$$1{,}000 = 318(1+.07)^t$$

$$\frac{1000}{318} = (1.07)^t$$

$$\log\left(\frac{1000}{318}\right) = \log\left((1.07)^t\right)$$

$$\frac{\log\left(\frac{1000}{318}\right) = t\log(1.07)}{\log(1.07)}$$

$$16.93\ldots = t$$

17 years

Explain how your graph of $A(t)$ confirms your answer.

It is about 1,000 at 17 years

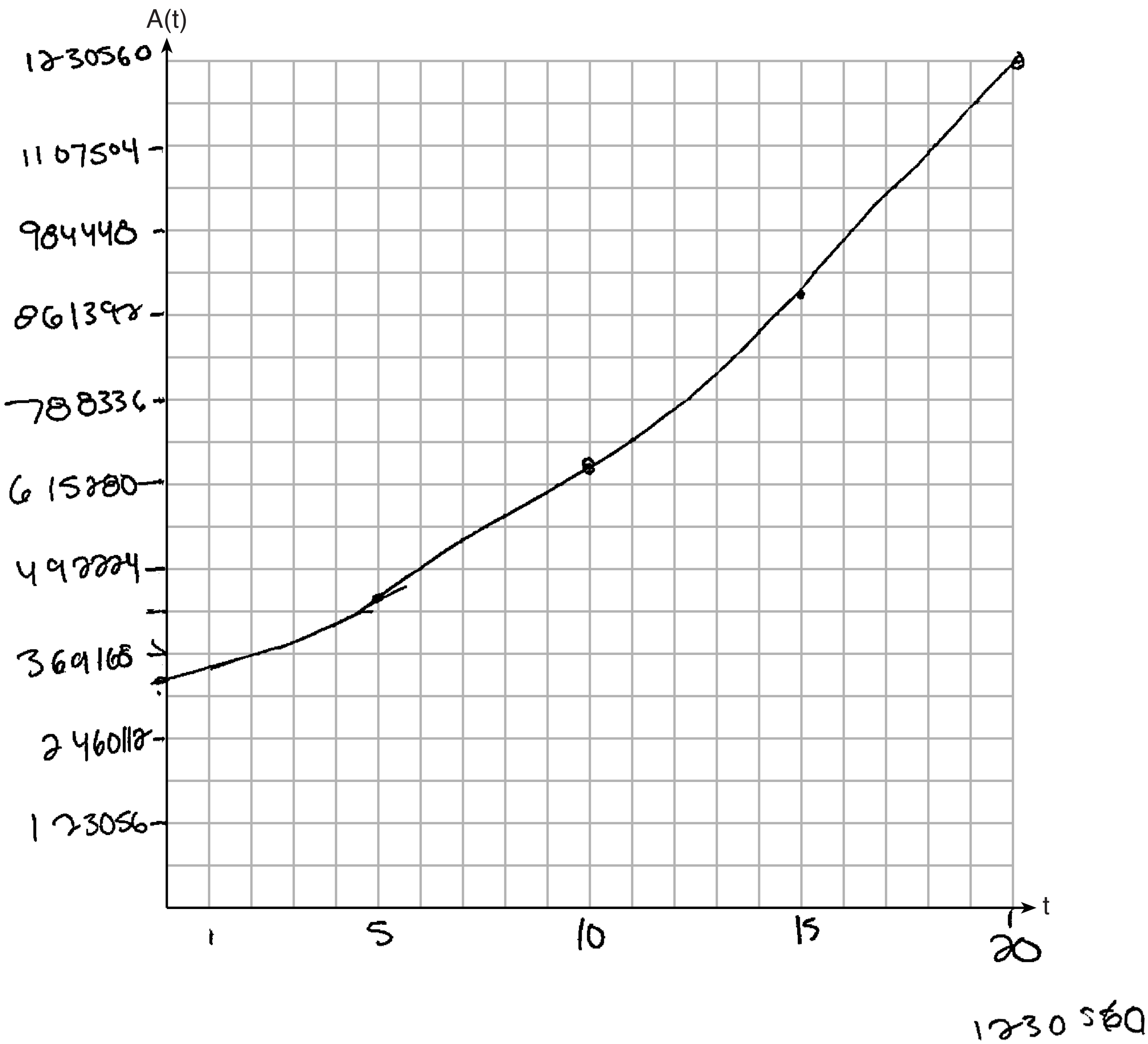
Question 37

37 Tony is evaluating his retirement savings. He currently has \$318,000 in his account, which earns an interest rate of 7% compounded annually. He wants to determine how much he will have in the account in the future, even if he makes no additional contributions to the account.

Write a function, $A(t)$, to represent the amount of money that will be in his account in t years.

$A(t) = 318000(1.07)^t$

Graph $A(t)$ where $0 \le t \le 20$ on the set of axes below.



Score 5: The student made a scaling error on the vertical axis.

Question 37 continued.

Tony's goal is to save $1,000,000. Determine algebraically, to the *nearest year*, how many years it will take for him to achieve his goal.

$$\frac{1000000 = 318000(1.07)^t}{318000}$$

$$\frac{1000000}{318000} = 1.07^t$$

$$\log_{1.07} \frac{1000000}{318000} = t$$

$$17 \approx t$$

Explain how your graph of $A(t)$ confirms your answer.

At $t = 17$, $A(t)$ is $\sim$ 1,000,000.

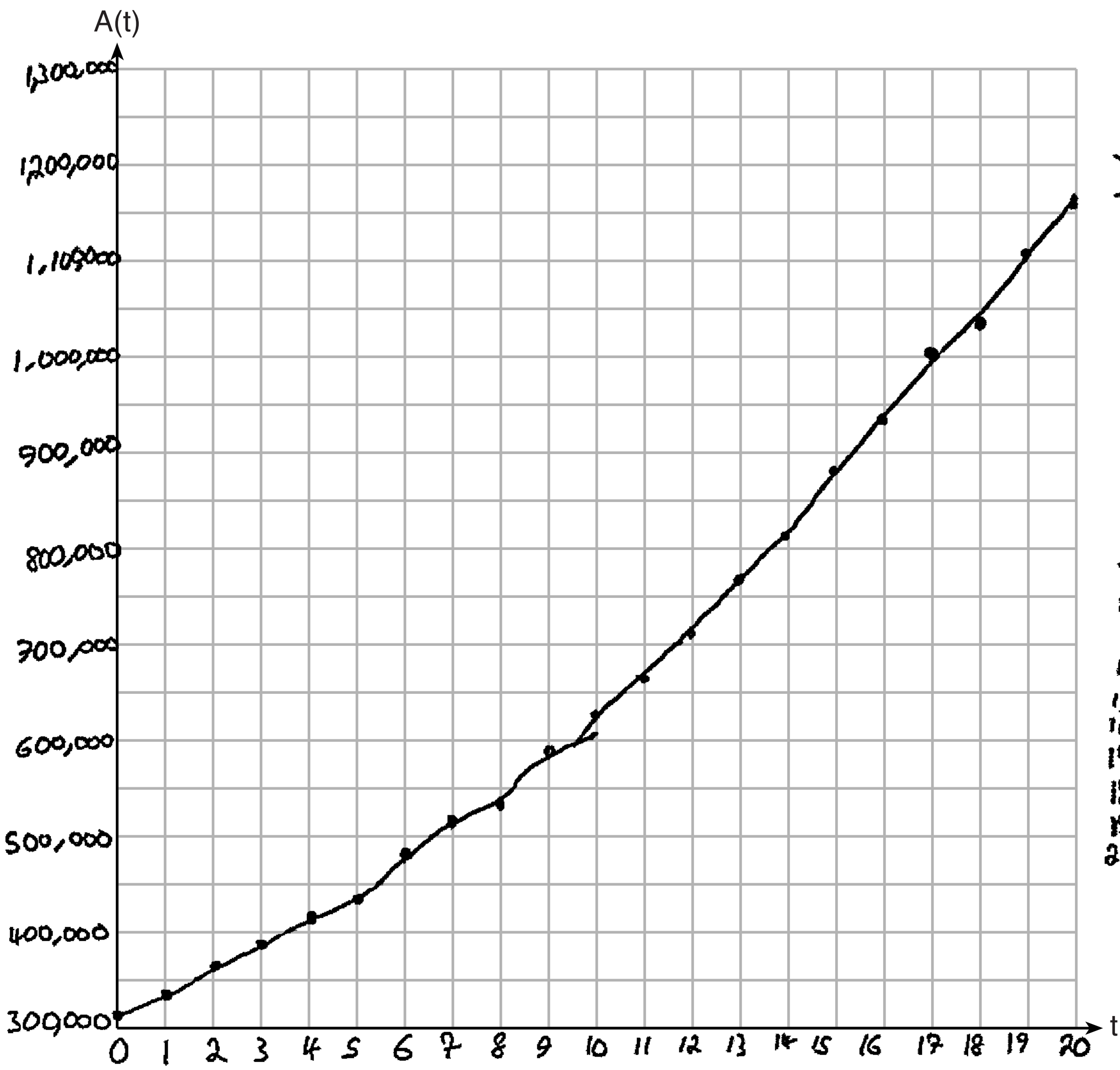
Question 37

37 Tony is evaluating his retirement savings. He currently has \$318,000 in his account, which earns an interest rate of 7% compounded annually. He wants to determine how much he will have in the account in the future, even if he makes no additional contributions to the account.

Write a function, $A(t)$, to represent the amount of money that will be in his account in t years.

$$A(t) = 318{,}000(1.07)^t$$

Graph $A(t)$ where $0 \le t \le 20$ on the set of axes below.



X	Y
0	318000
1	340260
2	364078
3	389564
4	416833
5	446011
6	479232
7	510639
8	546383
9	584636
10	625554

X	Y
11	669343
12	916197
13	766332
14	819974
15	877372
16	938088
17	1E6
18	1.07E6
19	1.05E6
20	1.25E6

Score 4: The student made a scaling error on the vertical axis and a graphing error at $t = 20$.

Tony's goal is to save $1,000,000. Determine algebraically, to the *nearest year*, how many years it will take for him to achieve his goal.

$$1{,}000{,}000 = 318000(1.07)^t$$

$$\log\left(\frac{1{,}000{,}000}{318{,}000}\right) = t\log(1.07)$$

$$\frac{\log\left(\frac{1{,}000{,}000}{318{,}000}\right)}{\log(1.07)} = t$$

$t \approx 17$ years

Explain how your graph of $A(t)$ confirms your answer.

At $x = 17$ the graph very closedy reaches $y = 1{,}000{,}000$.

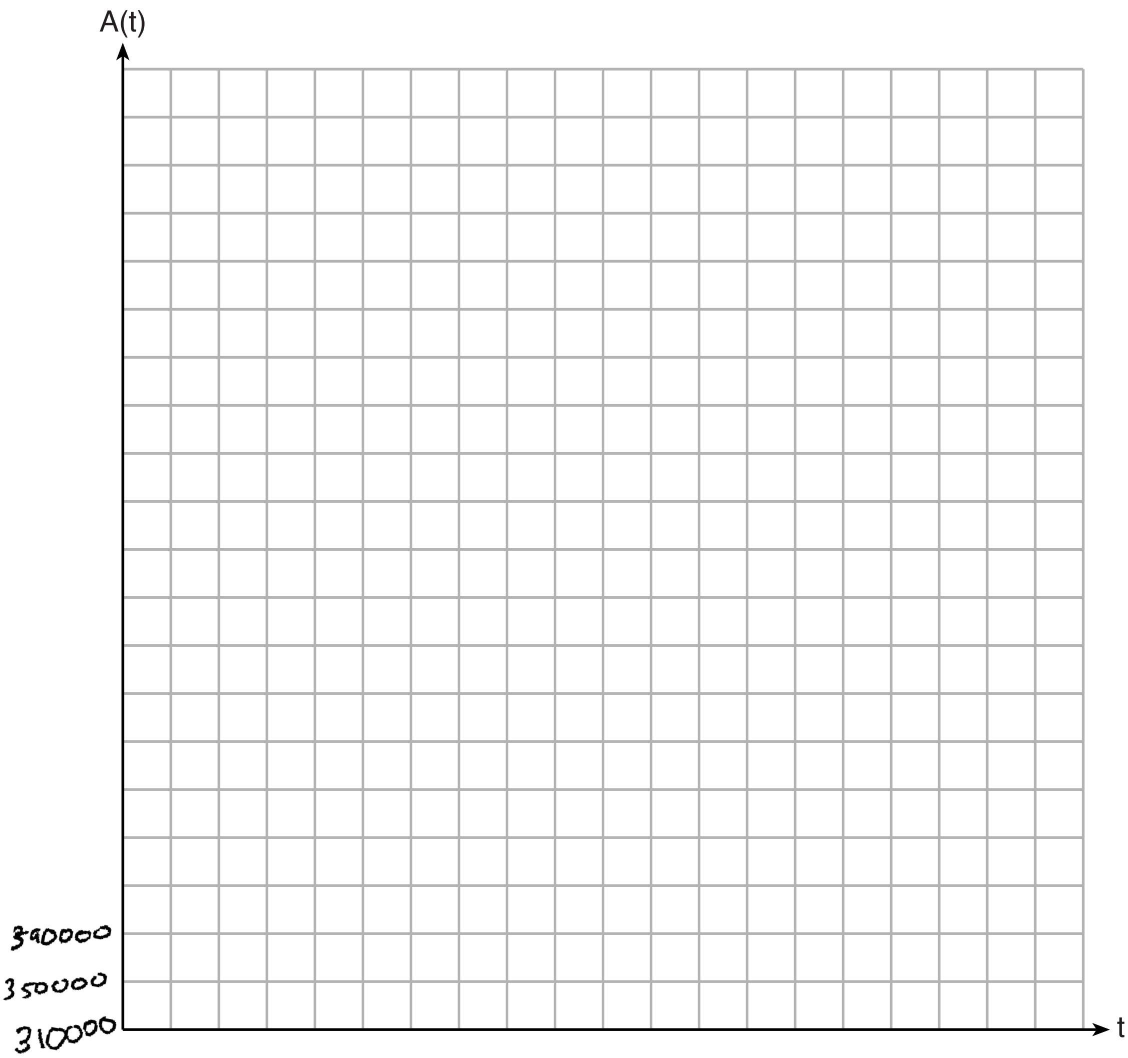
Question 37

37 Tony is evaluating his retirement savings. He currently has \$318,000 in his account, which earns an interest rate of 7% compounded annually. He wants to determine how much he will have in the account in the future, even if he makes no additional contributions to the account.

Write a function, $A(t)$, to represent the amount of money that will be in his account in t years.

$A = 318000\,(1+.07)^{t}$

Graph $A(t)$ where $0 \le t \le 20$ on the set of axes below.



Score 3: The student did not graph the function and provided an incorrect explanation.

Question 37 continued.

Tony's goal is to save $1,000,000. Determine algebraically, to the *nearest year*, how many years it will take for him to achieve his goal.

$1000000 = 318000(1+.07)^t$

$3.144654 = 1.07^t$

$\frac{\log 3.144654}{\log 1.07} = \frac{t \log 1.07}{\cancel{\log 1.07}}$

$16.93359123 = t$

17 years

Explain how your graph of $A(t)$ confirms your answer.

when the x value is at 17 the y value is at 1000000.

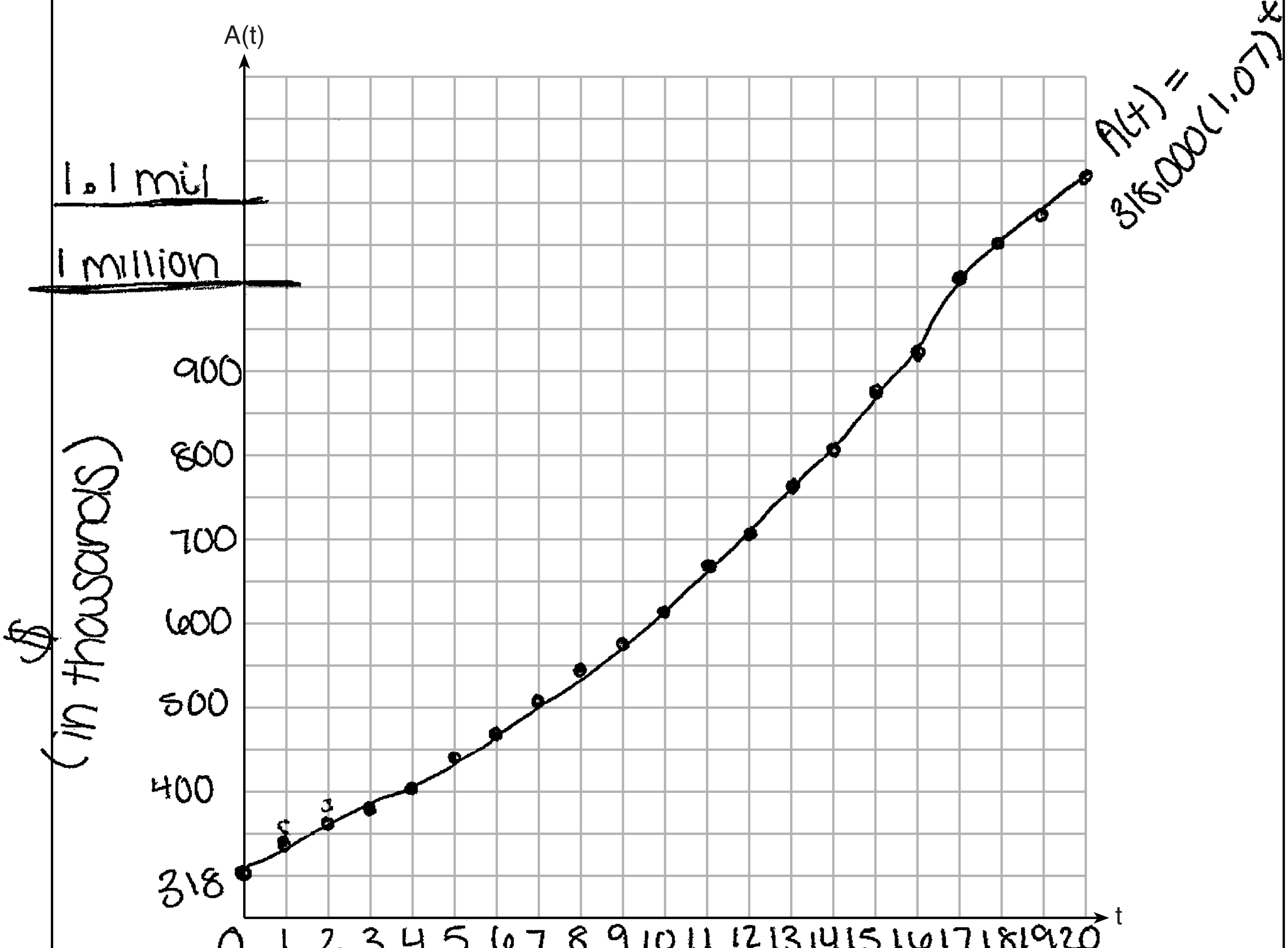
Question 37

37 Tony is evaluating his retirement savings. He currently has $318,000 in his account, which earns an interest rate of 7% compounded annually. He wants to determine how much he will have in the account in the future, even if he makes no additional contributions to the account.

Write a function, $A(t)$, to represent the amount of money that will be in his account in t years.

$A(t) = 318{,}000(1+0.07)^t$

Graph $A(t)$ where $0 \le t \le 20$ on the set of axes below.



Score 2: The student provided a correct function but made one graphing error scaling the vertical axis and provided no further correct work.

Tony's goal is to save \$1,000,000. Determine algebraically, to the *nearest year*, how many years it will take for him to achieve his goal.

$$A(t) = 318(1.07)^t$$

$$\frac{1{,}000{,}000}{1.07} = 818{,}000\frac{(1.\cancel{07})^t}{1.07}$$

$$934579.4393 = 318{,}000^t$$

Explain how your graph of $A(t)$ confirms your answer.

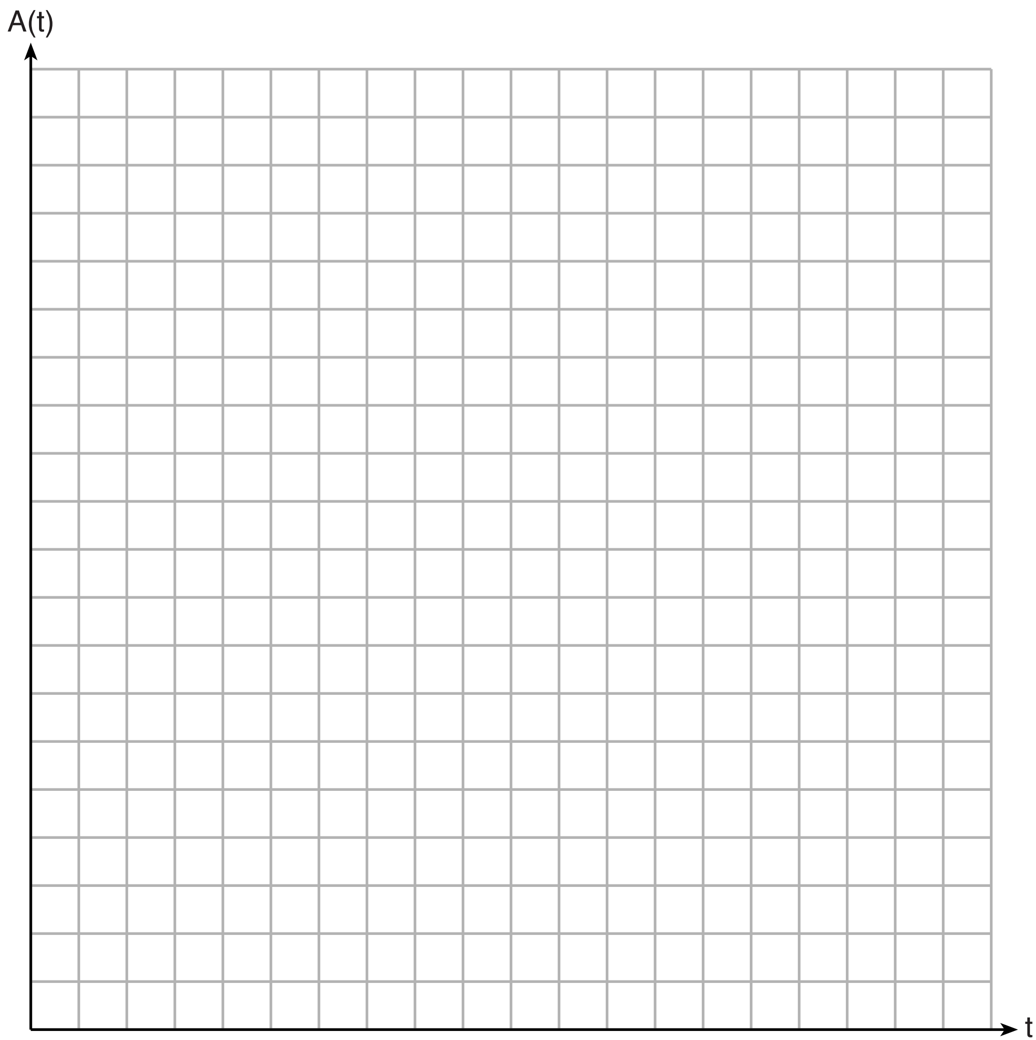
Question 37

37 Tony is evaluating his retirement savings. He currently has \$318,000 in his account, which earns an interest rate of 7% compounded annually. He wants to determine how much he will have in the account in the future, even if he makes no additional contributions to the account.

Write a function, $A(t)$, to represent the amount of money that will be in his account in t years.

$$A(t) = 318000(1+0.07)^t$$

Graph $A(t)$ where $0 \leq t \leq 20$ on the set of axes below.



Score 2: The student provided a correct function and found 17 using a method other than algebraic.

Tony's goal is to save \$1,000,000. Determine algebraically, to the *nearest year*, how many years it will take for him to achieve his goal.

$$318000(1+0.07)^{17} = 1004503.237$$

$$\approx 1{,}000{,}000$$

Tony will make 1000000 in approximately 17 years

Explain how your graph of $A(t)$ confirms your answer.

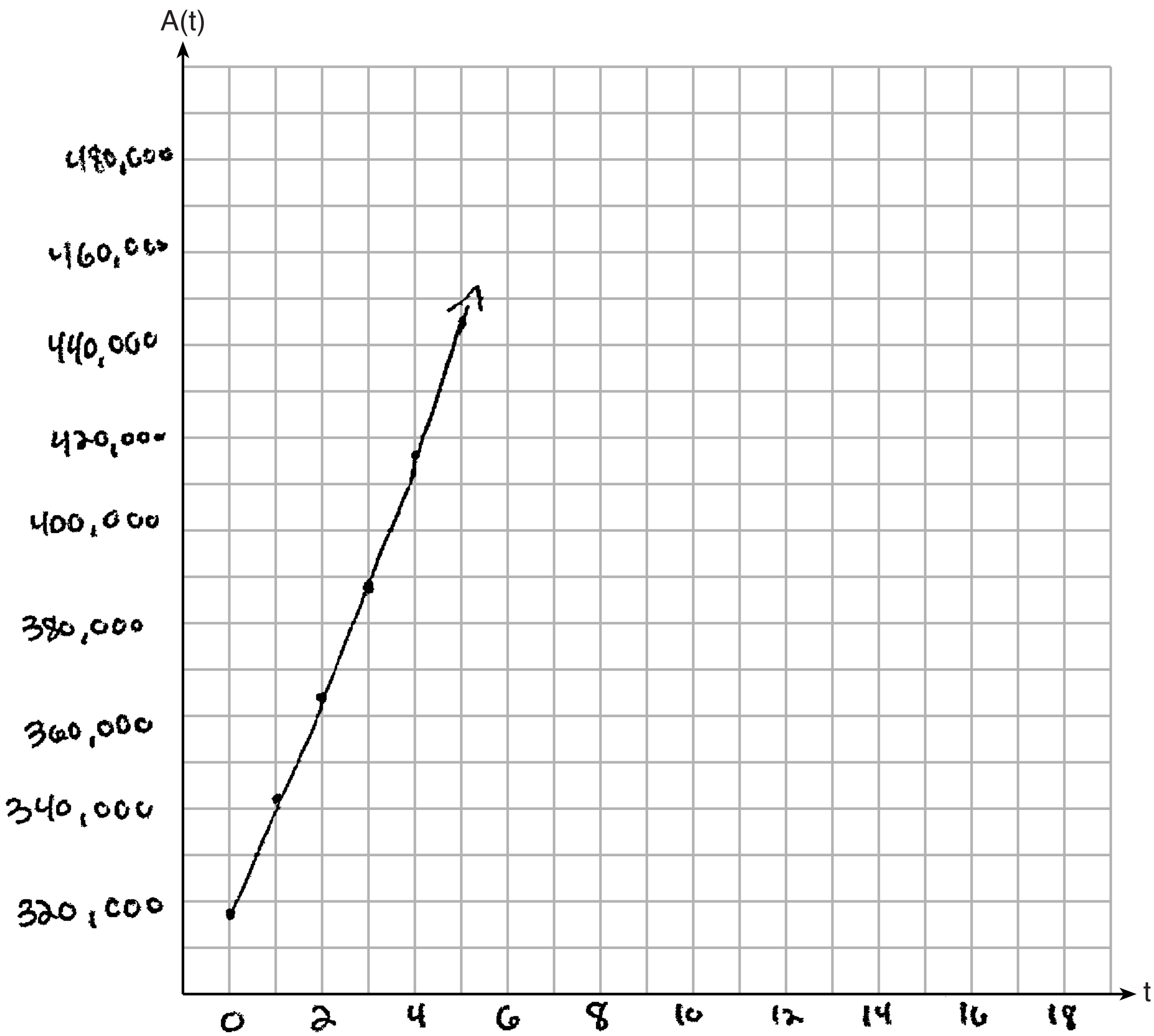
Question 37

37 Tony is evaluating his retirement savings. He currently has $318,000 in his account, which earns an interest rate of 7% compounded annually. He wants to determine how much he will have in the account in the future, even if he makes no additional contributions to the account.

Write a function, $A(t)$, to represent the amount of money that will be in his account in t years.

$A(t) = 318{,}000(1+.07)^t$

Graph $A(t)$ where $0 \le t \le 20$ on the set of axes below.



Score 1: The student only provided a correct function.

Tony's goal is to save $1,000,000. Determine algebraically, to the *nearest year*, how many years it will take for him to achieve his goal.

$318{,}000(1+.07)^{18}$

$1074818 = 18$ yrs.

Explain how your graph of $A(t)$ confirms your answer.

By the 18th yr. it reaches past 1 million

& by 17th not.

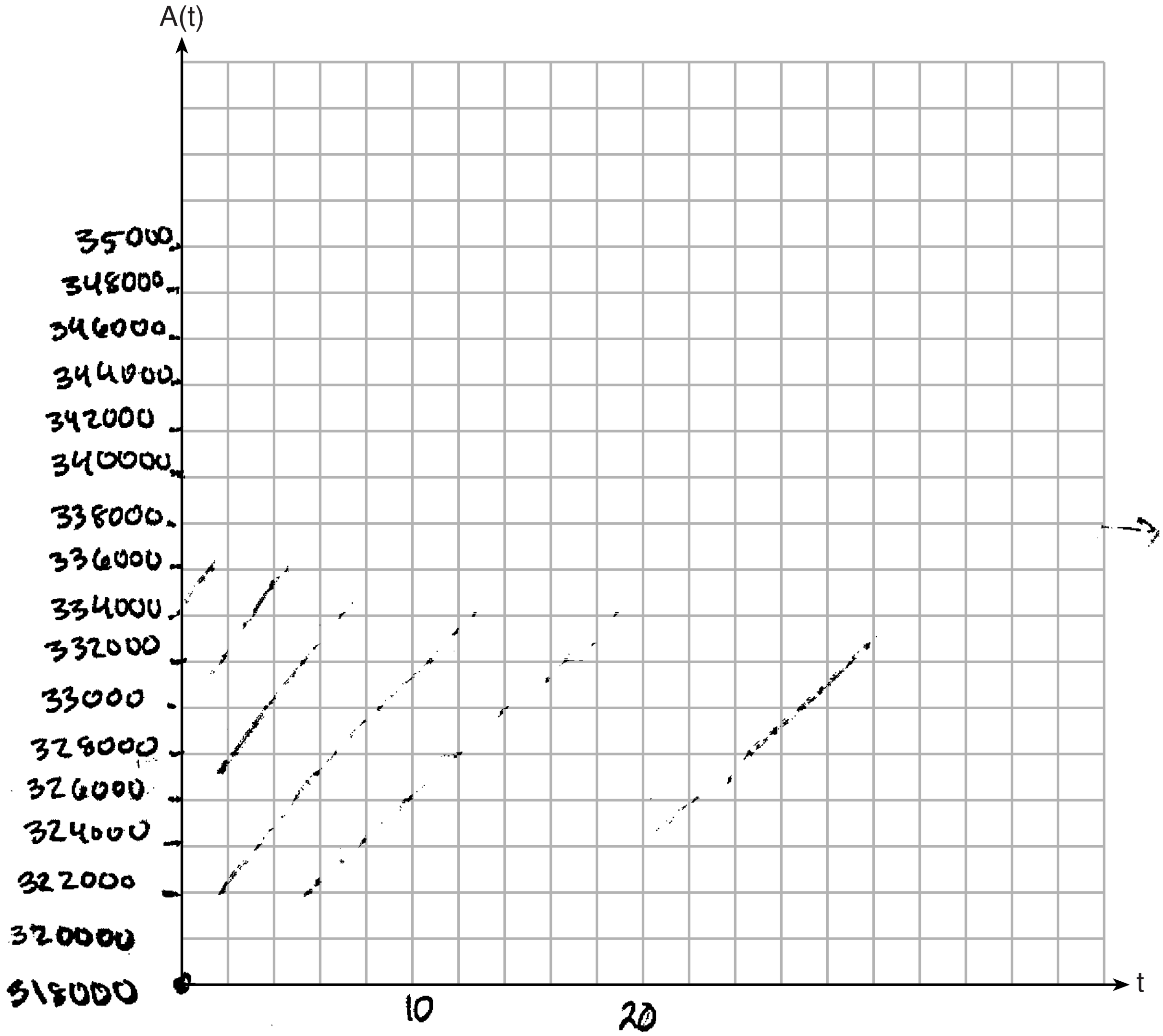
Question 37

37 Tony is evaluating his retirement savings. He currently has \$318,000 in his account, which earns an interest rate of 7% compounded annually. He wants to determine how much he will have in the account in the future, even if he makes no additional contributions to the account.

Write a function, $A(t)$, to represent the amount of money that will be in his account in t years.

$318{,}000(1.07^t)$

Graph $A(t)$ where $0 \le t \le 20$ on the set of axes below.



Score 0: The student wrote an expression, not a function.

Question 37 continued.

Tony's goal is to save \$1,000,000. Determine algebraically, to the *nearest year*, how many years it will take for him to achieve his goal.

Explain how your graph of $A(t)$ confirms your answer.