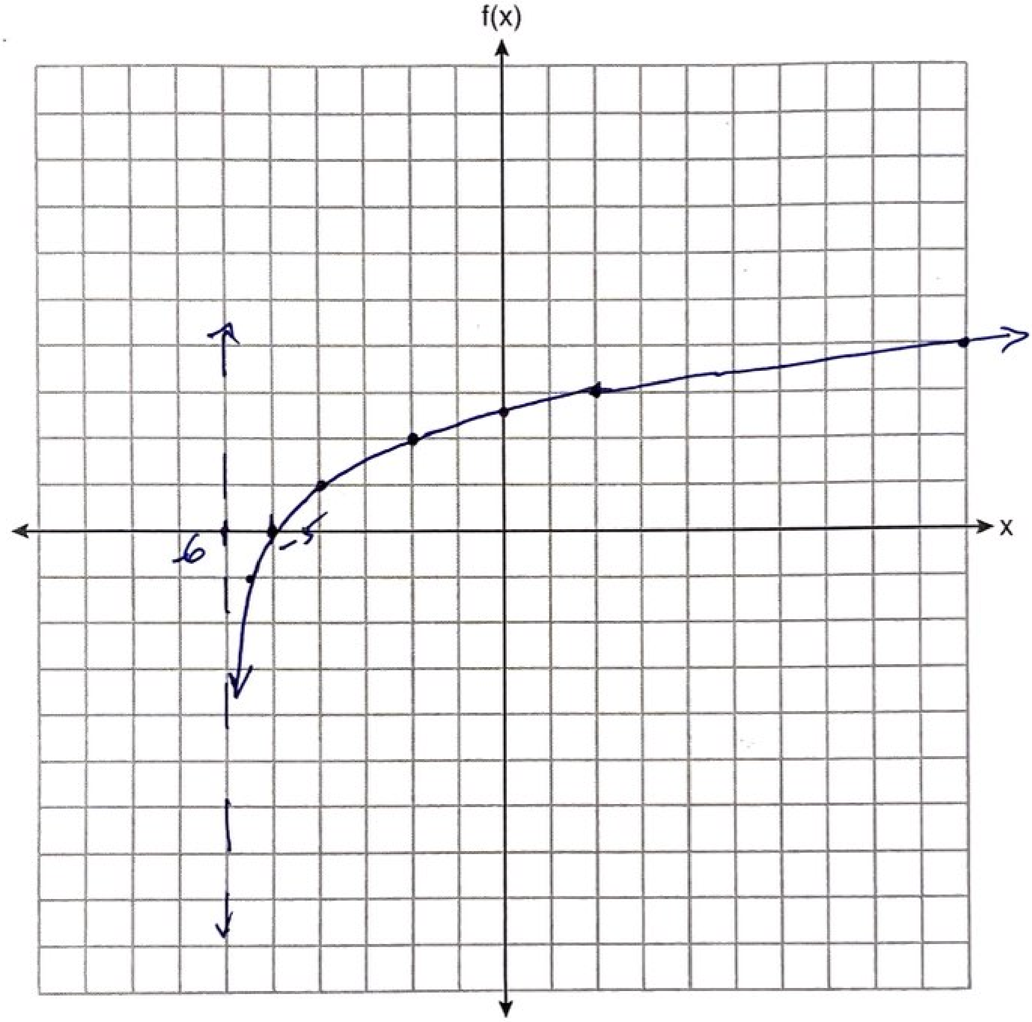
Name: Solutions

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

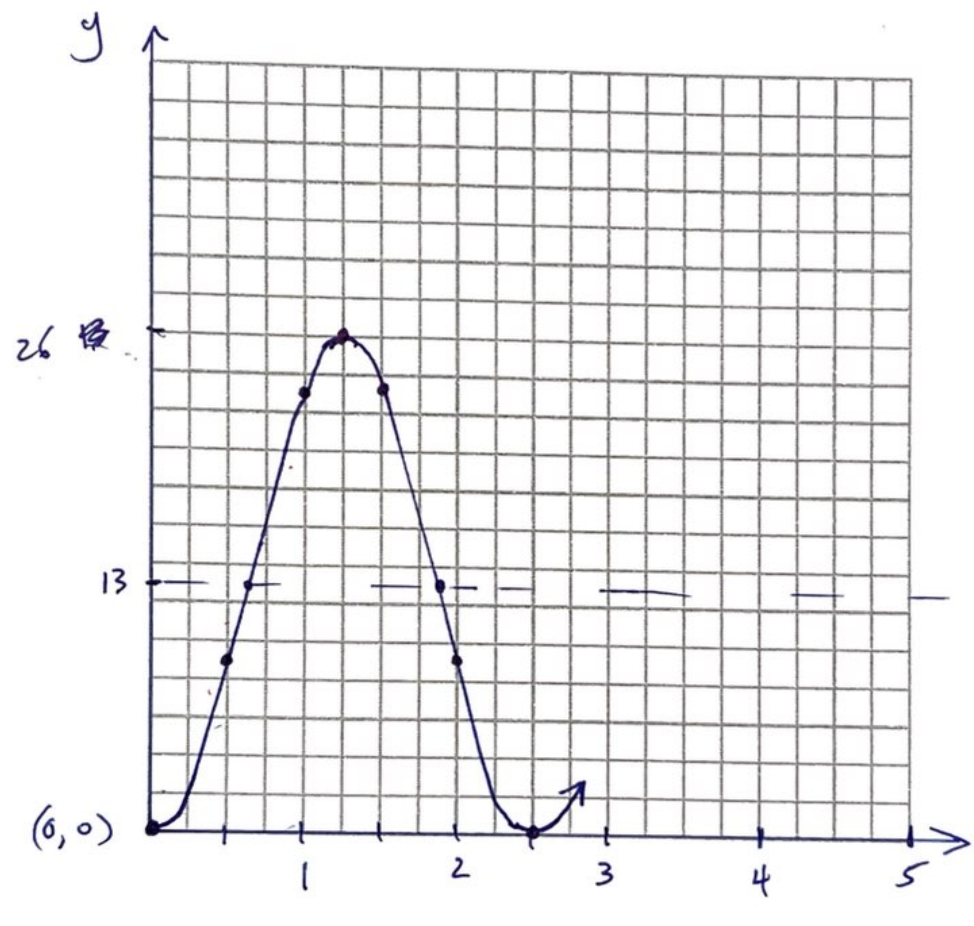


Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [6]

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

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



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

No. The maximum is (1.25, 26)

(the amplitude is 13 and the midline is y = 13. 13+13 = 26 max)

BECA/Huson/Algebra II: Regents Prep
6 May 2024

Name: Solutions

Practice Regents problems #7

AII-F.BF.2: Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

1. Given the sequence a: 32, 24, 18, 13.5, ...

   $\times 3/4$ $\times 3/4$

   (a) State whether the sequence is arithmetic, geometric, or neither. Justify your answer.

   $r = \frac{24}{32} = \frac{3}{4}$

   $\frac{18}{24} = \frac{3}{4}$

   $r = \frac{3}{4}$

   multiplied by a common factor, $r = \frac{3}{4}$

   (b) Write a recursive formula for a.

   $a_1 = 32$

   $a_n = \frac{3}{4} a_{n-1}$

   (c) Write an explicit formula for the sequence.

   $a_n = 32 \cdot \left(\frac{3}{4}\right)^{n-1}$

   (d) Find the sum of the first three terms the sequence.

   $32 + 24 + 18 = 74$

2. Express the fraction $\frac{3x^{\frac{5}{2}}}{(27x^3)^{\frac{2}{3}}}$ in simplest radical form.

   $= \frac{3x^{5/2}}{9x^2} = \frac{1}{3}\sqrt{x}$

AII-F.LE.2: Construct a linear or exponential function symbolically given: a graph, a description of the relationship, or two input-output pairs (include reading these from a table).

3. The area, in square meters, of a pond covered by an algae bloom decreases exponentially after a treatment is applied.

   (a) Fill out the table, giving the area covered by the algae in square meters days after the treatment is applied.

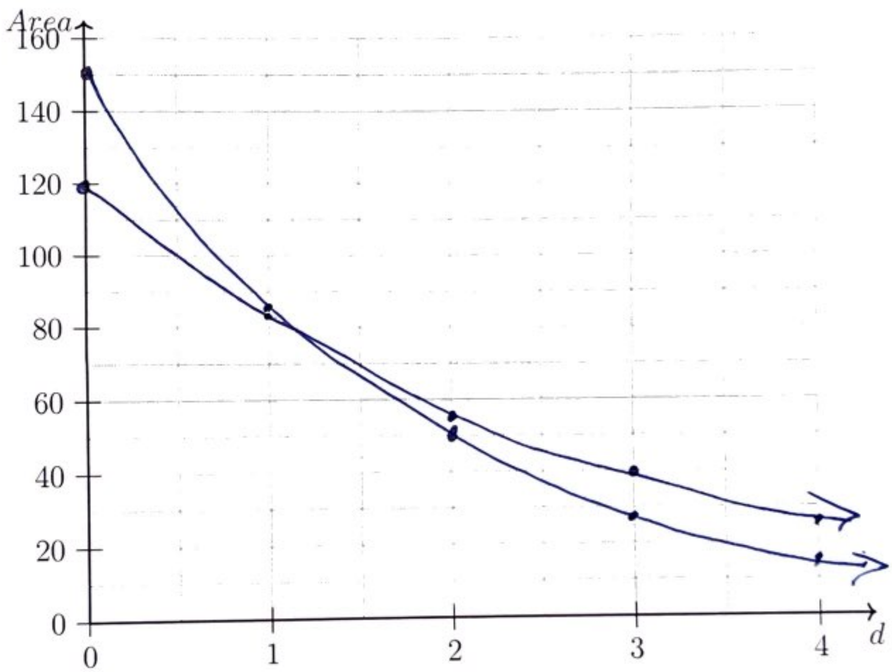
Days	0	1	2	3	4
Area	150	$150\sqrt{\frac{1}{3}}$	50	$50\sqrt{\frac{1}{3}}$	$16\frac{2}{3}$

86.6 28.9

$r = \left(\frac{50}{150}\right)^{\frac{1}{2}}$

$= \sqrt{\frac{1}{3}}$

   (b) Another pond has an algae bloom that is also decreasing exponentially. The area of this bloom in square meters is given by the function $B(d) = 120 \times 3^{-\frac{d}{3}}$, where d is days since the first measurement of the bloom.



   (c) Which of the two algae blooms was larger initially? Which is decreasing more quickly? Explain how you know.

The first ~~seq~~ algae bloom starts larger (150 > 120), but decreases more quickly as can be seen by the steepness of the graph

BECA/Huson/Algebra II: Regents Prep
8 May 2024

Name:
SOLUTIONS

Practice Regents problems #8

AII-F.BF.6 Represent and evaluate the sum of a finite arithmetic or finite geometric series, using summation (sigma) notation. For geometric series:

$$\sum_{k=1}^{n} a_k = a_1 + a_2 + \ldots + a_n = a_1\left(\frac{1-r^n}{1-r}\right)$$

1. Given the sequence a: $4\frac{1}{2}$, 6, 8, $10\frac{2}{3}$, …

   (a) State whether the sequence is arithmetic, geometric, or neither. Justify your answer by showing the calculation of the common difference d or ratio r.

   $r = \frac{6}{4.5} = \frac{4}{3}$

   $= \frac{8}{6} = 4/3$ etc.

   (b) Write a recursive formula for a.

   $a_1 = 4\frac{1}{2}$

   $a_n = a_{n-1}\left(\frac{4}{3}\right)$

   (c) Write an explicit formula for the sequence.

   $a_n = 4\frac{1}{2} \times \left(\frac{4}{3}\right)^{n-1}$

   (d) Find the sum of the first eight terms the sequence.

   $\sum_{n=1}^{8} a_n = 4\frac{1}{2}\left(\frac{1-(4/3)^8}{1-4/3}\right) = 121.3477\ldots$

   ≈ 121

2. Express each of the following in simplest radical form.

   (a) $(4x)^{\frac{1}{2}}$

   $= \sqrt{4x} = 2\sqrt{x}$

   (b) $9x^{-\frac{1}{2}}$

   $= \frac{9}{\sqrt{2}}$

AII-F.LE.2: Construct a linear or exponential function symbolically given: a graph, a description of the relationship, or two input-output pairs (include reading these from a table).

3. Two functions are compared, a linear function $f(x)$ and the exponential function $g(x)$.

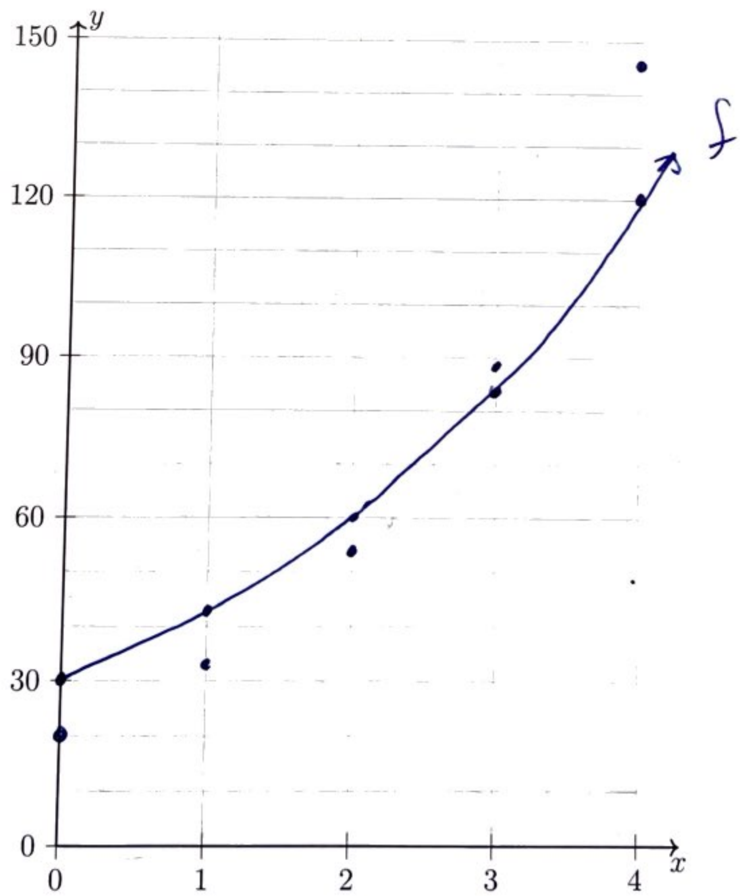
   (a) Fill out the table for $f(x)$ and write an explicit formula for the linear function.

$\times 2$

Days	0	1	2	3	4
Area	30	$30\sqrt{2}$	60	$60\sqrt{2}$	120

$\frac{60}{30} = 2$ $\quad r = 2^{\frac{1}{2}} = \sqrt{2}$

   (b) The geometric function is defined by $g(x) = 20 \cdot e^{\frac{x}{2}}$. On the grid below, sketch both functions, $f(x)$ and $g(x)$.



   (c) Mark the intersection of the two functions on the graph as an ordered pair, rounding to the *nearest tenth*.

AII-F.LE.2: Construct a linear or exponential function symbolically given: a graph, a description of the relationship, or two input-output pairs (include reading these from a table).

3. Two functions are compared, a linear function $f(x)$ and the exponential function $g(x)$.

(a) Fill out the table for $f(x)$ and write an explicit formula for the linear function.

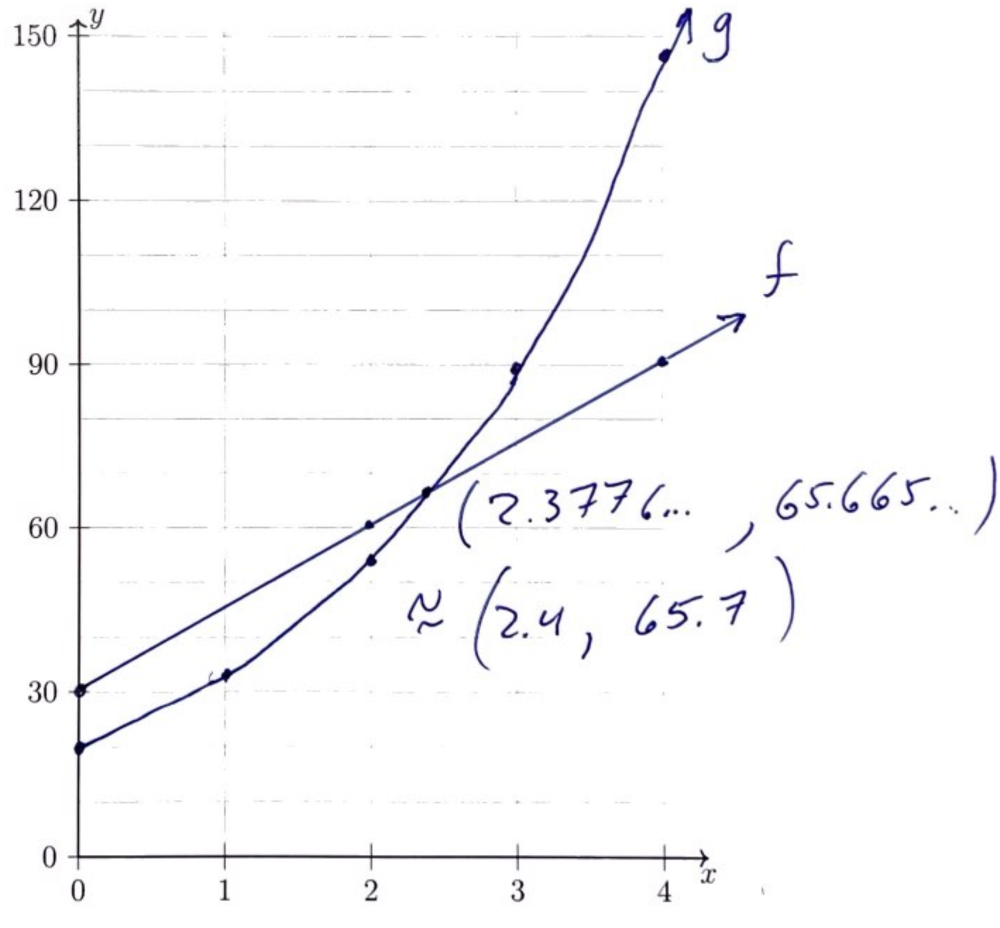
$+2$

Days	0	1	2	3	4
Area	30	45	60	75	90

$60 - 30 = 30$ $f(x) = 30 + 15(x)$

$d = \frac{30}{2} = 15$

(b) The geometric function is defined by $g(x) = 20 \cdot e^{\frac{x}{2}}$. On the grid below, sketch both functions, $f(x)$ and $g(x)$.



(c) Mark the intersection of the two functions on the graph as an ordered pair, rounding to the *nearest tenth.*