

Name:

S = L O T T O S

### Practice Regents problems #10

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

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

1. Given the geometric sequence  $20\frac{1}{4}, 27, 36, 48, \dots$

- (a) Find the common ratio  $r$ .

$$r = \frac{27}{20\frac{1}{4}} = \frac{36}{27} = \frac{48}{36} = \frac{4}{3}$$

- (b) Write a recursive formula for the sequence.

$$a_1 = 20\frac{1}{4}$$
$$a_n = \frac{4}{3} a_{n-1}$$

- (c) Write an explicit formula for the sequence.

$$a_n = 20\frac{1}{4} \left( \frac{4}{3} \right)^{n-1}$$

- (d) Find the sum of the first 10 terms the sequence rounded to the nearest hundredth.

$$S_{10} = 20\frac{1}{4} \times \left( \frac{1 - \left(\frac{4}{3}\right)^{10}}{1 - \frac{4}{3}} \right) = 1018.03189\dots$$
$$\approx 1018.03$$

2. Simplify each expression.

$$(a) \sqrt[4]{81x^2}$$
$$= 3x^{\frac{1}{2}}$$
$$= 3\sqrt{x}$$

$$(b) \frac{\sqrt[3]{x^6}}{\sqrt{x^{-4}}} = \frac{x^2}{x^{-2}}$$
$$= x^4$$

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. Given the cubic function  $f(x) = 0.2(x + 2)^2(x - 3)$ , graphed below.

(a) State the zeros of the function.

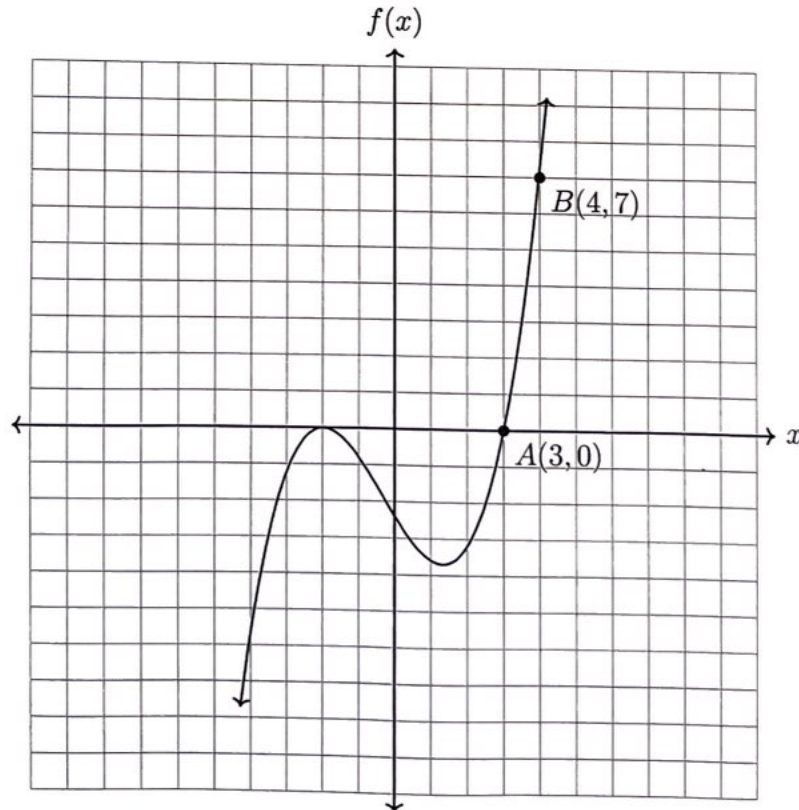
$$x = -2, 3$$

(b) Over the interval  $-2 < x < 1$ , is the function increasing, decreasing, or constant?

decreasing

(c) Find the average rate of change of the function over the interval from point A to point B.

$$\bar{m} = \frac{7-0}{4-3} = 7$$



Part III

Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, 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. [16]

- 33 A population of 950 bacteria grows continuously at a rate of 4.75% per day.

Write an exponential function,  $N(t)$ , that represents the bacterial population after  $t$  days and explain the reason for your choice of base.

$$N(t) = 950 \cdot e^{0.0475t}$$

Continuous growth is modeled with  
base  $e$

Determine the bacterial population after 36 hours, to the *nearest bacterium*.

$$N(36) = 950 \cdot e^{0.0475 \cdot 36}$$

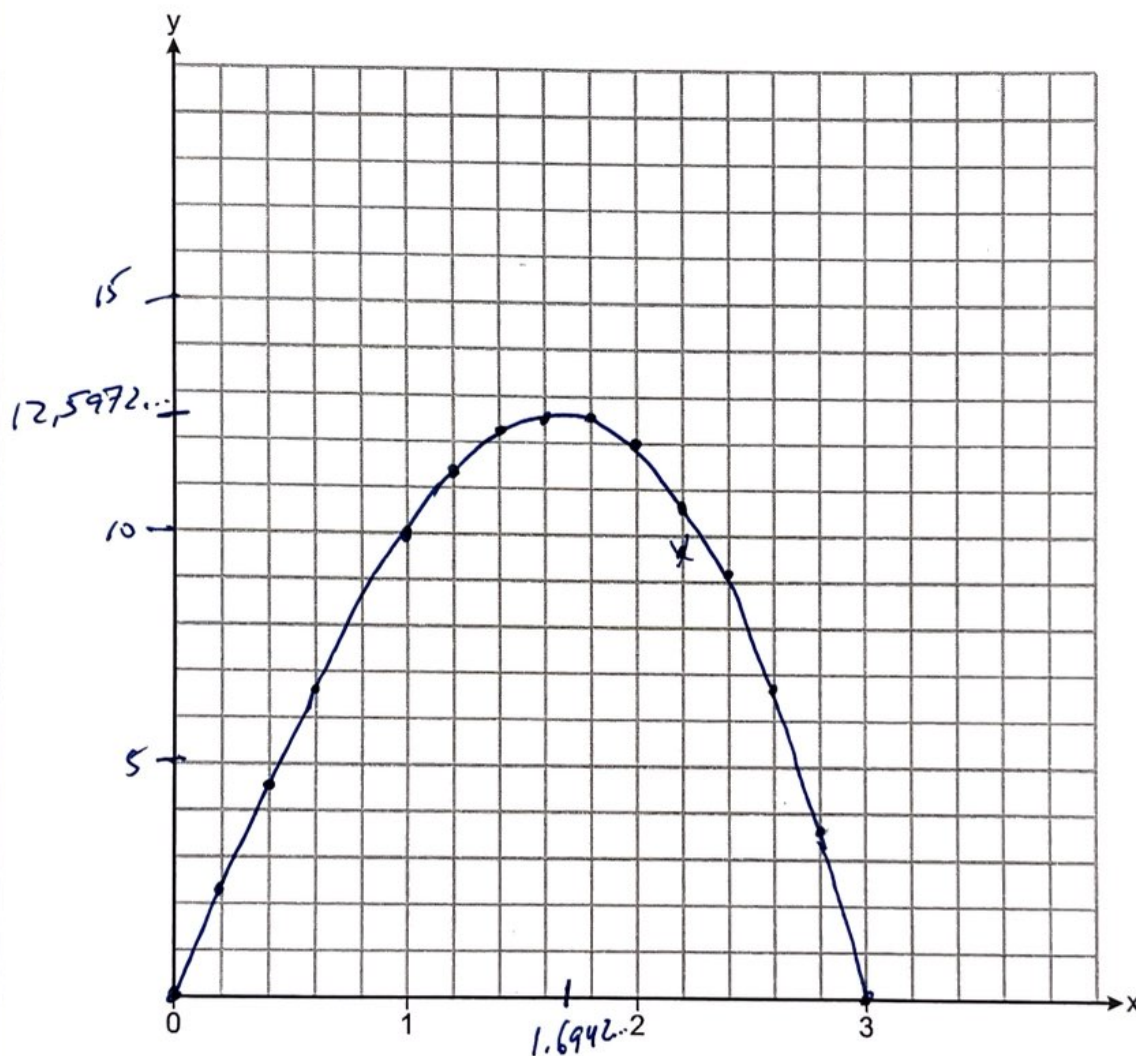
$$= 5252.5134...$$

$$\approx 5253$$

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

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



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

$$12.597201...$$
$$\approx 12.6 \text{ in}^3$$