BECA/Huson/Algebra 2: Regents Preparation Name:
23 May 2024

Prep #16 Polynomials and algebra

1. Simplify each expression.

   (a) $x^{\frac{2}{3}} \cdot x^{\frac{1}{3}} =$

   (b) $x^{\frac{4}{5}} \cdot x^{\frac{6}{5}} =$

   (c) $\dfrac{\sqrt[3]{8x^2}}{\sqrt{16x}} =$

   (d) $(x^{\frac{3}{2}}y^3)^2 =$

   (e) $(x^{\frac{2}{3}}y^4)^{\frac{1}{2}} =$

   (f) $\dfrac{x^{\frac{3}{4}}}{x^{\frac{1}{4}}} =$

2. Write the expression as a polynomial in standard form.

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

   (b) $(x+y)(x^2-xy+y^2)$

3. Simplify each complex expression to the form $a+bi$, with real numbers a and b.

   (a) $(2+3i)(3-4i) =$

   (b) $(2xi+4)^2 =$

   (c) $(2xi+4)^2 =$

   (d) $-2i(\sqrt{-3}+4i)-5i^3$

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

4. Solve each equation. Expression the answer in $a + bi$ form.

   (a) $2x^2 + 5x + 8 = 0$

   (b) $3x^2 + 7x + 5 = 0$

5. Determine the solution of each equation algebraically.

   (a) $\sqrt{3x + 7} = x - 1$

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

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Geometric Series:

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

6. Write a recursive formula for the sequence 16, 8, 0, -8, ...

7. A sequence is defined by the recursive formula

$$a_1 = 30$$
$$a_n = a_{n-1} + 5$$

Write an explicit formula for the sequence.

8. The sum of the first n terms of the geometric sequence beginning 1, 1.5, 2.25, ... is 171, rounded to *the nearest integer*. Find n.

9. Complete the table for the geometric sequence a.

n	1	2	3	4	5
a_n	100	80			

Model the sequence with an exponential function.

10. A survey was conducted to compare the dietary habits of American and Japanese families. Families were asked which they had eaten for dinner most recently, meat or fish. The proportions of each answer are shown in the table below.

Nationality	Meat	Fish	Total
Americans	0.78	0.22	1.00
Japanese	0.43	0.57	1.00

(a) Does the survey data indicate that Americans and Japanese families have similiar dietary habits? Justify your answer.

(b) 200 American families and 100 Japanese families participated in the survey. Calculate the number of each category of response and enter it in the appropriate cell in the table below.

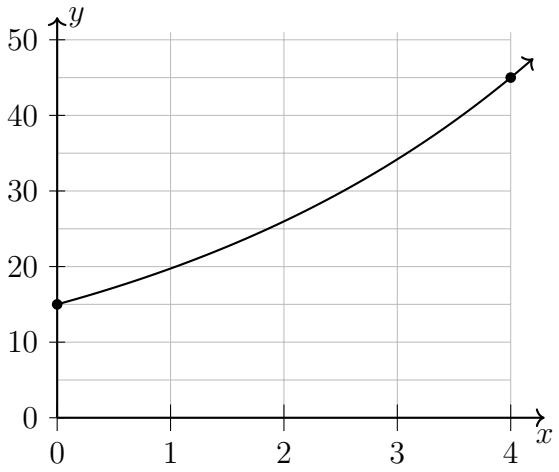
Nationality	Meat	Fish	Total
Americans			200
Japanese			100

(c) The survey was conducted in Kansas City (an inland city) and Tokyo (a city on the Pacific Ocean). How might that affect the survey's findings?

11. An exponential function $f(x)$ is graphed.

(a) Write down an equation for $f(x)$.

(b) Find the average rate of change of the function over the interval $0 < x < 4$.



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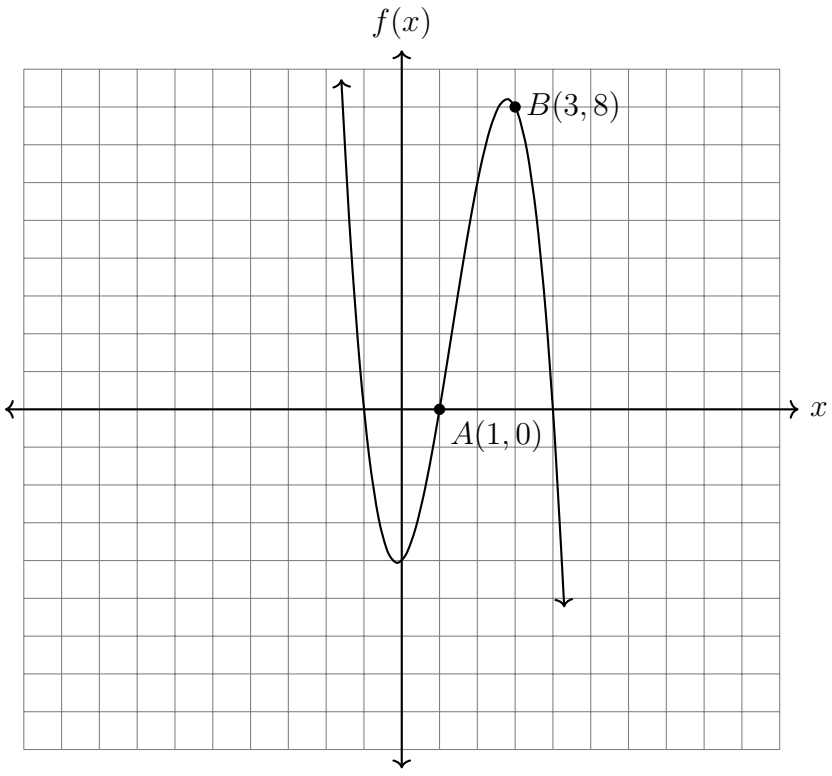
AII-F.LE.2: Construct a linear or exponential function symbolically given: a graph, a description of the relationship, or two input-output pairs (include reading these from a table).

12. Given the cubic function $f(x) = -x^3 + 4x^2 + x - 4$, graphed below.
    (a) How many real solutions are their to the equation $f(x) = 0$?

    (b) Write down the real zeros of the function.

    (c) Over the interval $3 < x < 4$, is the function increasing, decreasing, or constant?

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



13. Factor the function $f(x) = x^3 + 4x^2 - 4x - 16$ over the set of integers.

14. Given the function $f(x) = x^3 - 2x^2 - 9x + 18$, find the value of $f(2)$.

Now identify the correct statement.

(a) $f(2) = 0$ and $x - 2$ is a factor of $f(x)$.

(b) $f(2) = 0$ and $x - 2$ is not a factor of $f(x)$.

(c) $f(2) \neq 0$ and $x - 2$ is a factor of $f(x)$.

(d) $f(2) \neq 0$ and $x - 2$ is not a factor of $f(x)$.

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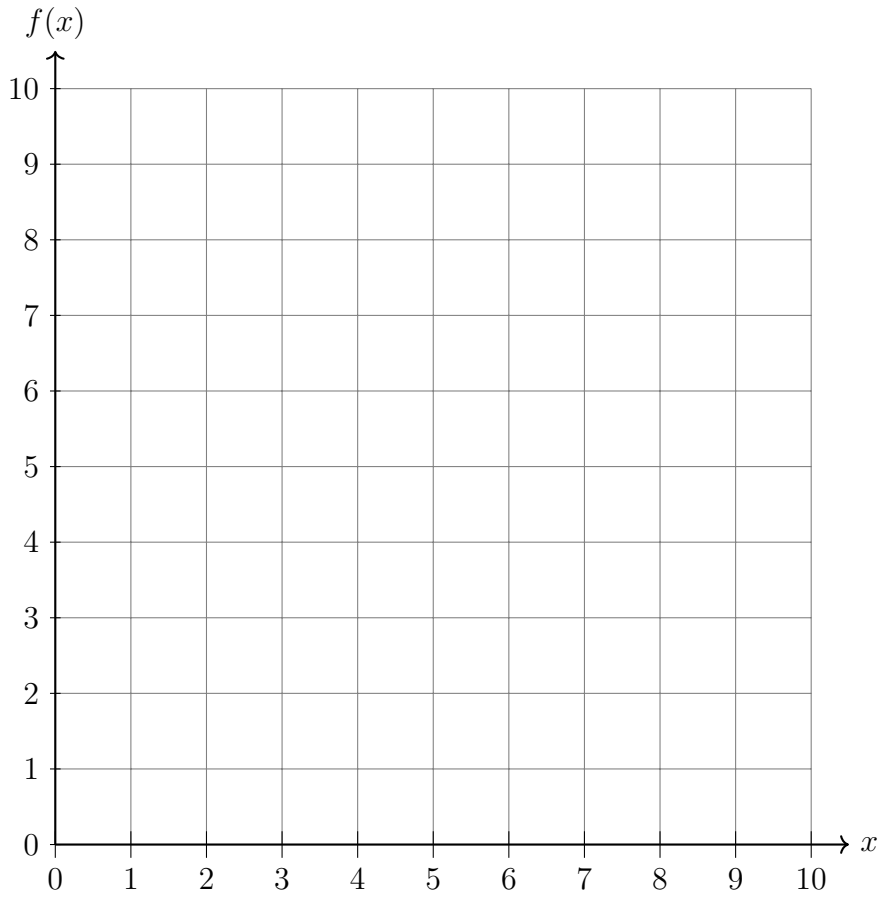
15. Graph the continuous exponential function $f(x) = 3e^{0.10x}$ on the grid below.



(a) Graph the line $y = 6$. Mark the intersection of the line with f and label it as an ordered pair, rounded *the nearest whole number*.

(b) The function $f(x)$ models the growth of an investment. Explain what the values of 3 and 0.10 represent in the context of the investment.

(c) How long will the investment take to double?