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

Prep #15 Pre-Exam: Algebra **Mental math - no calculators**

1. Perform the operations and simplify the expression.

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

   (b) $\frac{3}{10} + \frac{2}{5} =$

   (c) $\frac{2}{3} + \frac{1}{3} =$

   (d) $\frac{1}{2} - \frac{1}{6} =$

   (e) $\frac{3}{4} - \frac{1}{8} =$

   (f) $\frac{1}{2} - \frac{1}{4} =$

2. Convert between fractions and percentages.

   (a) $\frac{1}{4} =$

   (b) $\frac{2}{3} =$

   (c) $\frac{5}{4} =$

   (d) $50\% =$

   (e) $75\% =$

   (f) $33\frac{1}{3}\% =$

3. Round to the accuracy stated.

   (a) nearest hundredth: 0.125

   (b) nearest tenth: 5.7111

   (c) nearest thousandth: 11.54795

   (d) nearest tenth: 9.9505

   (e) nearest hundredth: π

   (f) nearest hundredth: $\sqrt{2}$

4. N.RN.2 Convert between radical expressions and expressions with rational exponents using the properties of exponents.

   (a) $x^3 \cdot x^3 =$

   (b) $x^{-3} \cdot x^5 =$

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

   (d) $\sqrt{x^2} =$

   (e) $\sqrt[4]{x^8} =$

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

5. Simplify the expression by combining like terms.

   (a) $3x + 2x =$

   (b) $-4y + 2y =$

   (c) $5x - 3x + 2x =$

   (d) $-7y + 3y - 2y =$

   (e) $3x^2 + 2x^2 =$

   (f) $-4y^2 + 2y^2 =$

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

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

   (b) $(5 - 2i) - (3 + 4i) =$

   (c) $(2i)(3i) =$

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

7. Solve for x over the complex numbers using the quadratic formula:

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

   (a) $x^2 - 3x + 6 = 0$

   (b) $2x^2 - 6x + 7 = 0$

8. Solve for x over the real numbers.

   (a) $\sqrt{x - 2} = 4$

   (b) $\sqrt{x^2 + 9} + 4 = 9$

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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.

For a geometric series:

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

9. Write a recursive formula for the sequence 2, 5, 8, 11, ...

10. Write an explicit formula for the sequence $14\frac{1}{4}$, $8\frac{3}{4}$, $3\frac{1}{4}$, $-2\frac{1}{4}$, ...

11. Given the sequence beginning 2, 6, 18, 54, ..., find the sum of the first 12 terms.

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

12. Complete the table for $f(x)$ and write an explicit formula for the exponential function.

x	0	1	2	3	4
$f(x)$	10	20			

13. The frequency table below shows the barbeque selections at the school field day.

Class	Hot dog	Hamburger	Chicken
Middle school	25	15	10
High School	30	40	15

(a) Add totals to the table.

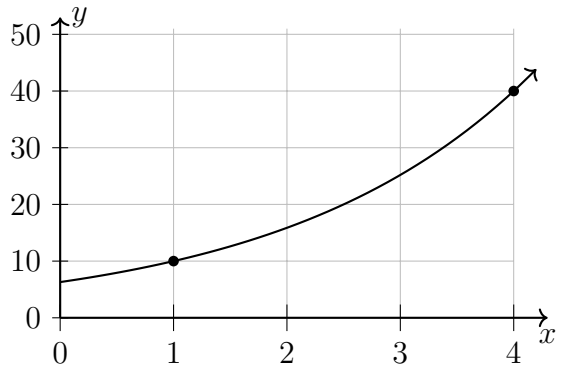
(b) Overall, what was the least favorite selection?

(c) What percentage of the overall survey are middle school students?

(d) Complete the missing values in the table of proportions rounded to *the nearest thousandth*.

Class	Hot dog	Hamburger	Chicken	Total
Middle school				
High School				
Total				

14. Determine the average rate of change, in mph, from one to four hours on the graph.



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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).

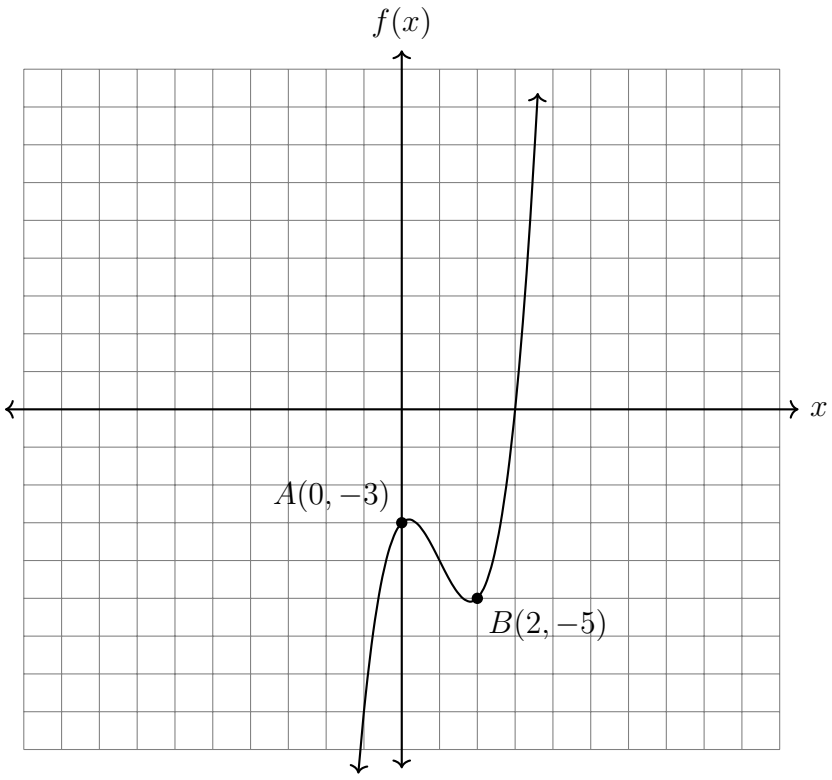
15. Given the cubic function $f(x) = x^3 - 3x^2 + x - 3$, graphed below.

    (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 $2 < x < 3$, 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.



16. Go through the steps to factor by grouping $f(x) = x^3 + 4x^2 - 4x - 16$

17. 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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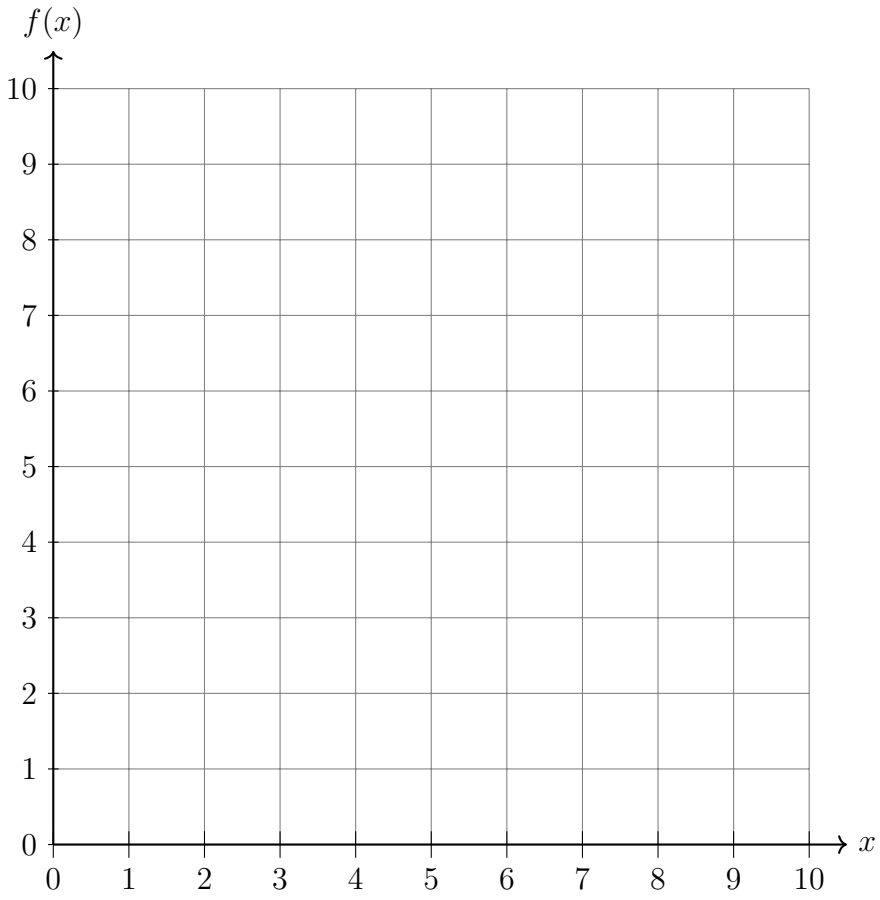
18. Graph the continuous exponential function $f(x) = 2e^{0.12x}$ on the grid below.



(a) Graph the line $y = 4$. 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 2 and 0.12 represent in the context of the investment.

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