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 number of students who turned in their homework on time.

Class	On time	Late
11.1	18	12
11.2	15	10
11.3	17	8

(a) Add totals to the table.

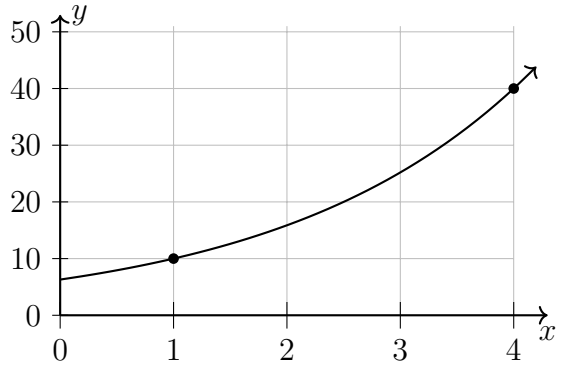
(b) Which class has the most students?

(c) What percentage of all students turned in their homework on time?

(d) Using the blank template below, translate the values above into decimal proportions of the whole student population rounded to *the nearest thousandth*.

Class	On time	Late	Total
11.1			
11.2			
11.3			
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).

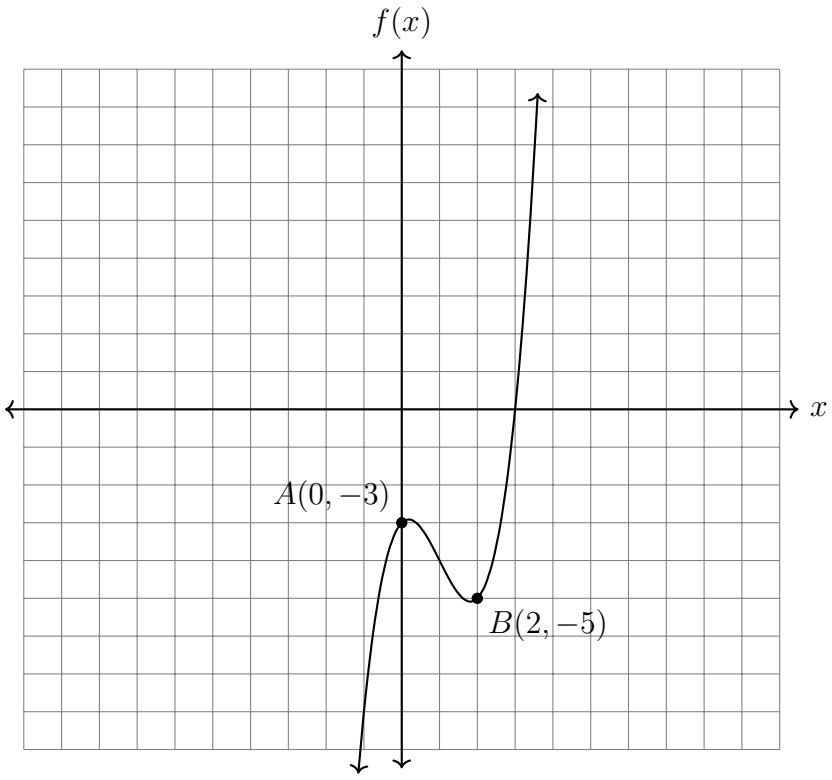
15. Given the cubic function $f(x) = x^3 - 3x^2 + x - 3$, graphed below.

    (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 $f(x) = x^3 - 2x^2 - 9x + 18$

    (a) Use your calculator to find the zeros of the function.

    (b) Write down the factors of the function.

    (c) Write the final row and complete the grouping step by filling in the blanks.

$$\begin{aligned} f(x) &= x^3 - 2x^2 - 9x + 18 \\ &= (x^3 - 2x^2) - (9x - 18) \\ &= \_\_\_\_\_\,(x-2) - \_\_\_\_\_\,(x-2) \\ &= (x^2 - 9)(x - 2) \\ &= \end{aligned}$$

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

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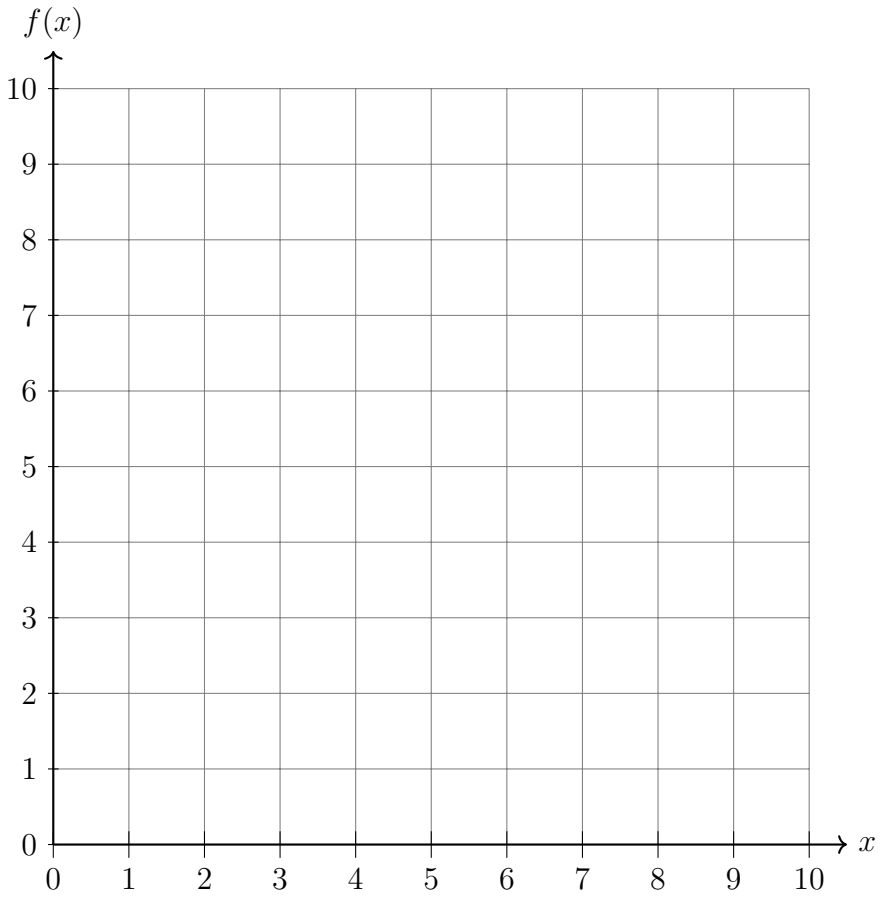
18. Graph the continuous exponential function $f(x) = 2e^{0.12x}$ on the grid below.



(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?