14 May 2018 Name: .

Test corrections: Exponential & polynomial functions

Do all problems. The numbers have changed.

1. The expression $(x + a)(x + b)$ can not be written as
   (a) $a(x + b) + b(x + b)$
   (b) $x^2 + ax + bx + ab$
   (c) $x^2 + (a + b)x + ab$
   (d) $x(x + a) + b(x + a)$
2. (a) What is the quotient and the remainder when $f(x) = 3x^3 + 9x^2 + 8x - 5$ is divided by $x + 2$?

   (b) Given your answer to part (a), what is the value of $f(-2)$?

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3. The expression $(x + a)(x - b)$ can not be written as

   (a) $x(x + a) - b(x + a)$

   (b) $x^2 + ax - bx - ab$

   (c) $x^2 + (a - b)x + ab$

   (d) $x(x - b) + a(x - b)$

4. A manufacturing company has developed a cost model, $C(x) = 0.15x^3 + 0.01x^2 + 2x + 120$, where x is the number of items sold, in thousands. The sales price can be modeled by $S(x) = 30 - 0.01x$. Therefore, revenue is modeled by $R(x) = x \cdot S(x)$.

   The company's profit, $P(x) = R(x) - C(x)$, could be modeled by what polynomial?

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5. A bank account earns interest at a continuous interest rate of 3.925% per year. The initial deposit is \$175. Which function models the value of the balance?

   (a) $P(t) = 175 \cdot 1.04^t$

   (b) $P(t) = 175(1 + 0.03925)^t$

   (c) $P(t) = 175 \cdot 1.03925^t$

   (d) $P(t) = 175 \cdot e^{0.04t}$

6. Carlos puts \$10,000 into an investment account with interest compounded continuously. If the annual interest rate is 3.75% what is the balance after 4 years?

7. Algebraically determine the values of h and k to correctly complete the identity stated below.

$$3x^3 - 5x^2 + 5 = (x - 2)(3x^2 + hx + 2) + k$$

8. Simplify the expression $\sqrt{x^6y^3}$.

9. Write $\sqrt[3]{a^5} \div a^{\frac{2}{3}}$ as an expression with positive, integer exponents.

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10. What is the expression $2i^3(-2i+5)$ is equivalent to? Express your answer in the form $a+bi$, where $a, b \in \mathbb{R}$.

11. Simplify the expression $(1x-3i)^2$, where i is the imaginary unit. Express your answer in the form $a+bi$, where $a, b \in \mathbb{R}$.

12. The function $p(t) = 110e^{0.0325t}$ models the population of a city, in millions, t years after 2010.

    (a) Initially, as of 2010, what is the population in millions?

    (b) What is the annual continuous rate, expressed as in percent, that the population increases?

    (c) Find the population in 2015, rounded to the nearest million.

    (d) In what year will the population be approximately 138 million?

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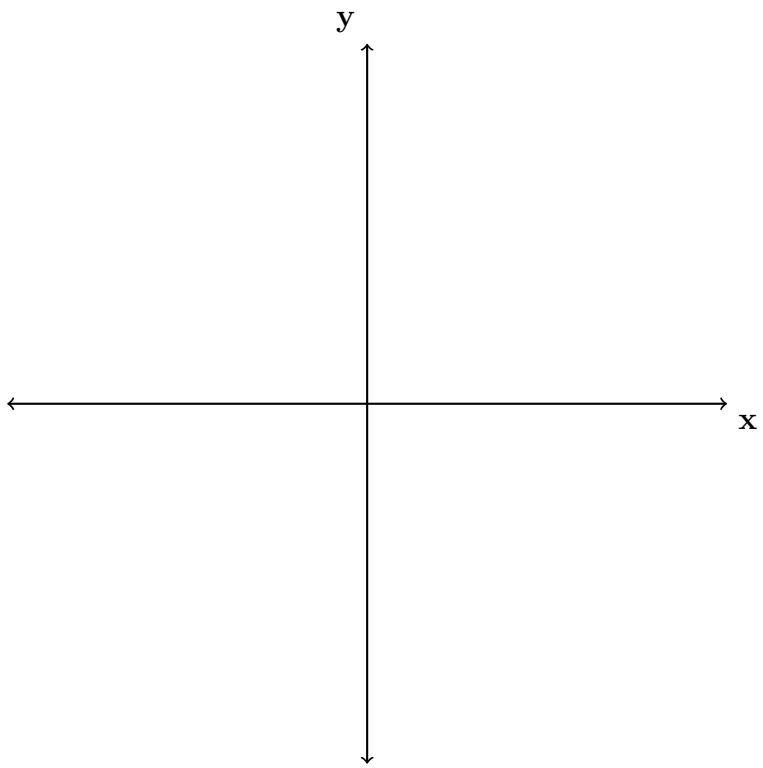
13. On the axes below, sketch a possible function $p(x) = (x - a)(x - b)(x + c)$, where a, b, and c are positive, $a > b$, and $p(x)$ has a positive y-intercept of d. Label all intercepts.



14. If $p(x) = 2x^3 - 3x + 5$, what is the remainder of $p(x) \div (x - 5)$?

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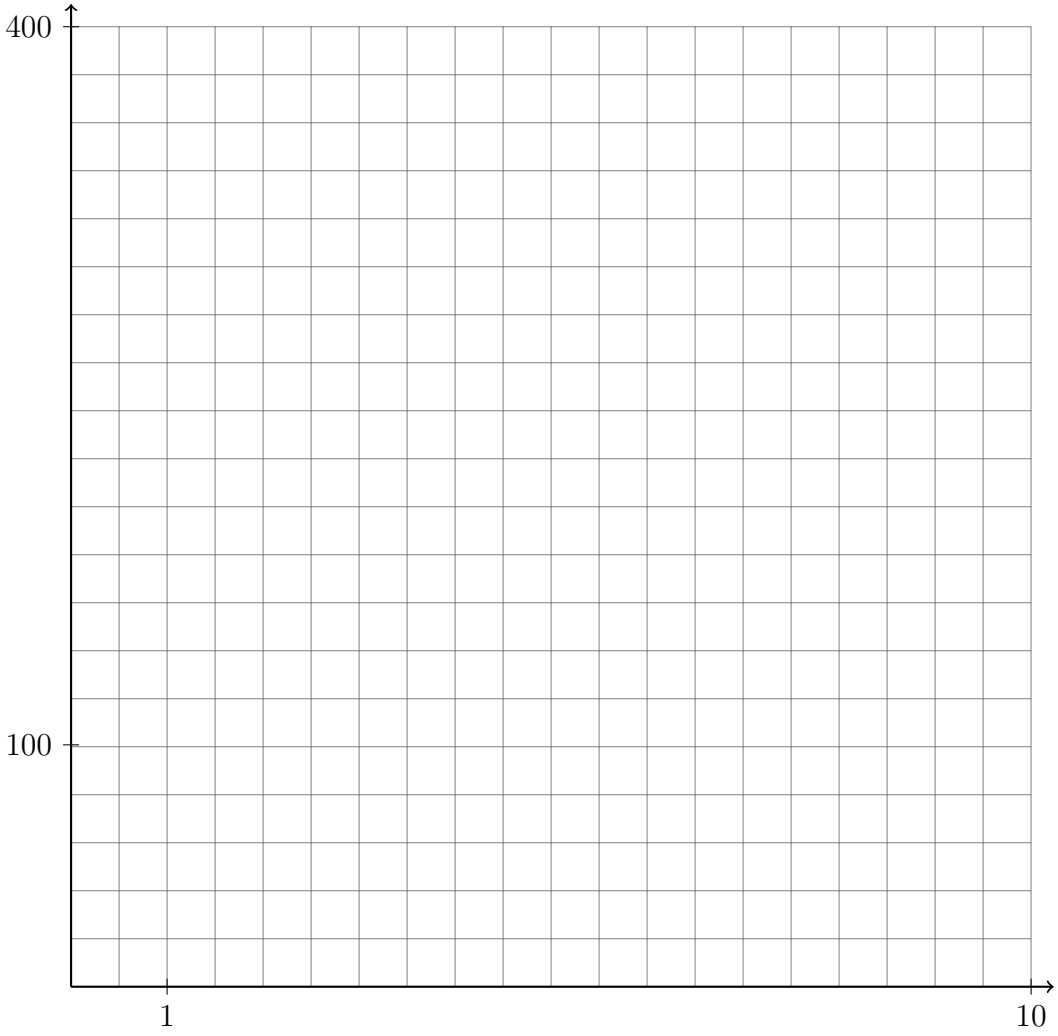
15. Graph $y = 350(.75)^{0.8x} - 50$ on the set of axes below.



16. Explain how $(-27)^{\frac{4}{3}}$ can be evaluated using properties of rational exponents to result in an integer answer.