

Test: Exponential & polynomial functions

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 $f(x) = 3x^3 + 8x^2 + 7x + 3$ is divided by $x + 2$?

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

3. 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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4. 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) $P(t) = 175 \cdot e^{0.04t}$

5. Carlos puts \$12,500 into an investment account with interest compounded continuously. If the annual interest rate is 3.15% what is the balance after 5 years?

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

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

7. Simplify the expression $\sqrt{x^4y^2}$.

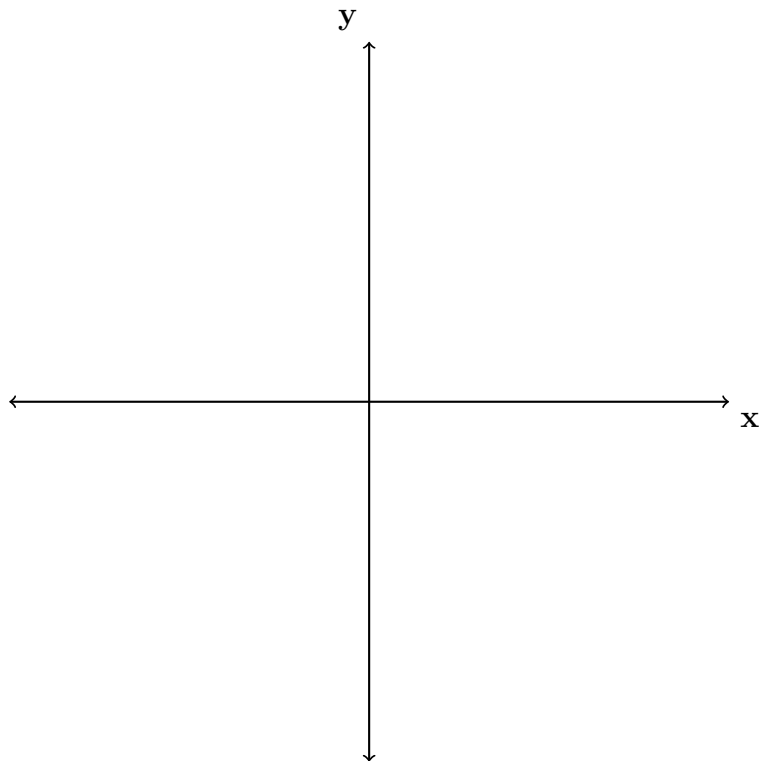
8. Write $\sqrt{a^5} \div a^{\frac{1}{2}}$ as an expression with positive, integer exponents.

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9. What is the expression $2i^3(-2i + 5)$ equivalent to? Express your answer in the form $a + bi$, where $a, b \in \mathbb{R}$.
10. Simplify the expression $(1x - 3i)^2$, where i is the imaginary unit. Express your answer in the form $a + bi$, where $a, b \in \mathbb{R}$.
11. 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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12. 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.



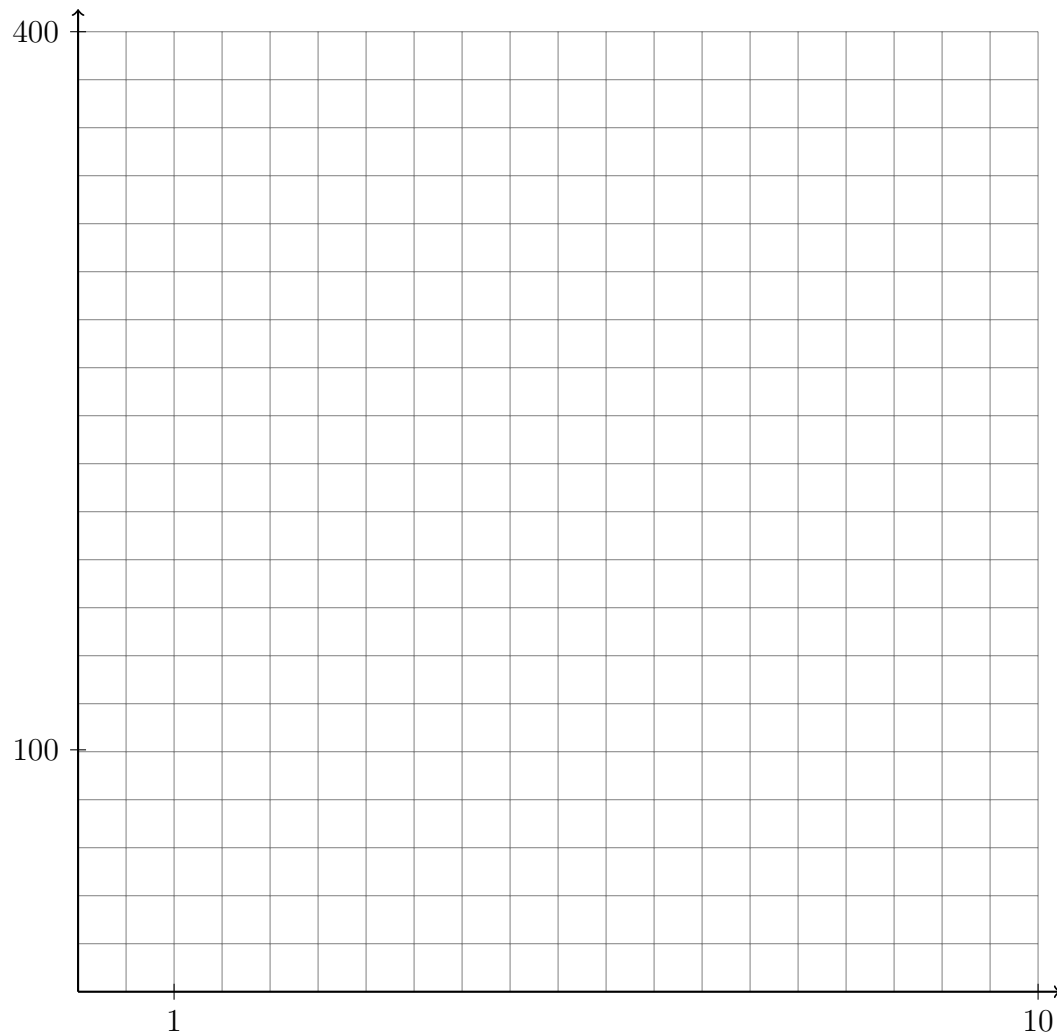
13. If $p(x) = 2x^3 - 3x + 5$, what is the remainder of $p(x) \div (x - 5)$?

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14. Graph $y = 400(.75)^{0.6x} - 25$ on the set of axes below.



15. Explain how $(-8)^{\frac{4}{3}}$ can be evaluated using properties of rational exponents to result in an integer answer.