BECA / Huson / Algebra 2: Polynomials Jan 2023 Regents Name:
9 April 2024

Regents problems: Polynomials

1. Which expression is equivalent to $(x + 2)^2 - 5(x + 2) + 6$?

    (a) $x(x - 1)$

    (b) $(x - 3)(x - 2)$

    (c) $(x - 4)(x + 3)$

    (d) $(x - 6)(x + 1)$

2. The expression $\dfrac{x^4 - 5x^2 + 4x + 14}{x + 2}$ is equivalent to

    (a) $x^3 - 2x^2 - x + 6 + \dfrac{2}{x + 2}$

    (b) $x^3 - 5x + 4 - \dfrac{14}{x + 2}$

    (c) $x^3 + 2x^2 - x + 2 + \dfrac{18}{x + 2}$

    (d) $x^3 + 2x^2 - 9x + 22 - \dfrac{30}{x + 2}$

3. Given $x \neq -3$, which expression is equivalent to $\dfrac{2x^3 + 3x^2 - 4x + 5}{x + 3}$?

    (a) $2x^3 + 9x^2 + 23x + 74$

    (b) $2x^2 - 3x + 5 - \dfrac{10}{x + 3}$

    (c) $2x^3 - 3x^2 + 5x - 10$
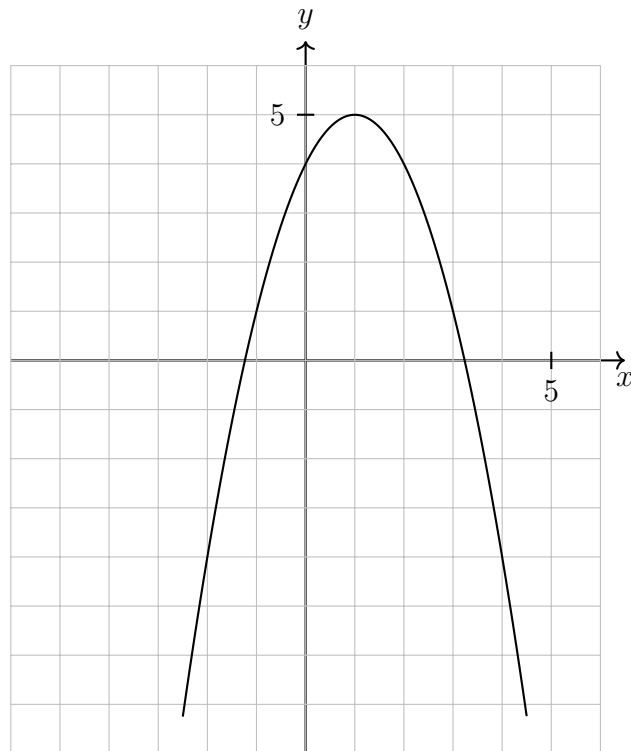
    (d) $2x^3 + 9x + 23 + \dfrac{74}{x + 3}$

4. If $f(x) = 2x^4 - x^3 - 16x + 8$, then $f\left(\frac{1}{2}\right)$

    (a) equals 0 and $2x + 1$ is a factor of $f(x)$

    (b) equals 0 and $2x - 1$ is a factor of $f(x)$

    (c) does not equal 0 and $2x + 1$ is not a factor of $f(x)$

    (d) does not equal 0 and $2x - 1$ is a factor of $f(x)$

5. What is the solution set of the equation $\dfrac{x + 2}{x} + \dfrac{x}{3} = \dfrac{2x^2 + 6}{3x}$?

(a) $\{-3\}$

(b) $\{-3, 0\}$

(c) $\{3\}$

(d) $\{0, 3\}$

6. The graph of a quadratic function is shown below.

Then the graph of $x + y = 4$ is drawn on the same axes, one solution to this system is

(a) $(4, 0)$

(b) $(1, 5)$

(c) $(2, 2)$

(d) $(3, 1)$

7. How many real solutions exist for the system of equations below?

$$y = \frac{1}{4}x - 8$$
$$y = \frac{1}{2}x^2 + 2x$$

(a) 1

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(b) 2

(c) 3

(d) 0

8. Which equation represents a polynomial identity?

   (a) $x^3 + y^3 = (x + y)^3$

   (b) $x^3 + y^3 = (x + y)(x^2 - xy + y^2)$

   (c) $x^3 + y^3 = (x + y)(x^2 - xy - y^2)$

   (d) $x^3 + y^3 = (x - y)(x^2 + xy + y^2)$

9. Given $f(x) = x^4 - x^3 - 6x^2$, for what values of x will $f(x) > 0$?

   (a) $x < -2$, only

   (b) $-2 < x$ or $x > 3$

   (c) $-2 < x$ or $0 \leq x \leq 3$

   (d) $x > 3$, only

10. Consider a cubic polynomial with the characteristics below.

    - exactly one real root

    - as $x \to \infty$, $f(x) \to -\infty$

    Given $a > 0$ and $b > 0$, which equation represents a cubic polynomial with these characteristics?
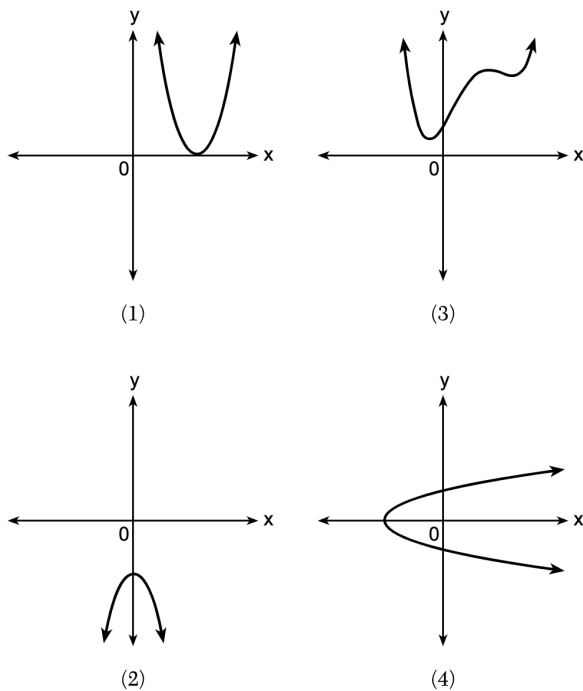
    (a) $f(x) = (x - a)(x^2 + b)$
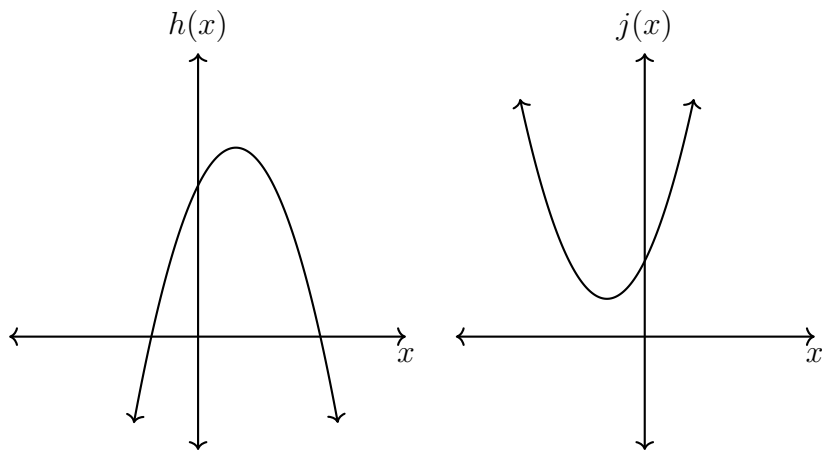
    (b) $f(x) = (a - x)(x^2 + b)$

    (c) $f(x) = (a - x^2)(x^2 + b)$

    (d) $f(x) = (x - a)(b - x^2)$

11. Which graph shows a quadratic function with two imaginary zeros?

4

(1)

(3)

(2)

(4)

12. In the quadratic formula, $b^2 - 4ac$ is called the discriminant. The function $f(x)$ has a discriminant value of 8, and $g(x)$ has a discriminant value of -16. The quadratic graphs, $h(x)$ and $j(x)$, are shown below.

$h(x)$

$j(x)$

Which quadratic functions have imaginary roots?

(a) $g(x)$ and $h(x)$

(b) $g(x)$ and $j(x)$

(c) $f(x)$ and $h(x)$

(d) $f(x)$ and $j(x)$

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13. Algebraically determine the zeros of the function below.

$$r(x) = 3x^3 + 12x^2 - 3x - 12$$

14. Write the expression $A(x) \cdot B(x) - 3C(x)$ as a polynomial in standard form.

$$A(x) = x^3 + 2x - 1$$
$$B(x) = x^2 + 7$$
$$C(x) = x^4 - 5x$$

15. Over the set of integers, completely factor $x^4 - 5x^2 + 4$.

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16. Graph $y = x^3 - 4x^2 + 2x + 7$ on the set of axes below.