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. What is the solution set of the equation $\dfrac{4}{k^2 - 8k + 12} = \dfrac{k}{k-2} + \dfrac{1}{k-6}$?

(a) $\{-1, 6\}$

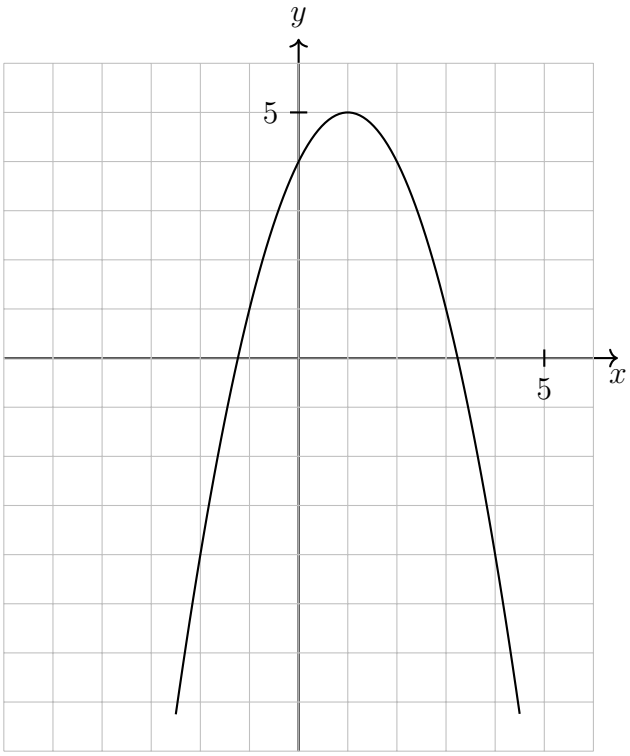
(b) $\{1, -6\}$

(c) $\{-1\}$

(d) $\{1\}$

7. Solve for x algebraically: $\dfrac{x}{x-6} + \dfrac{x}{x-2} = \dfrac{4}{x^2 - 8x + 12}$

8. 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) $(3, 1)$

9. 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

(b) 2

(c) 3

(d) 0

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

11. 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

12. 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?

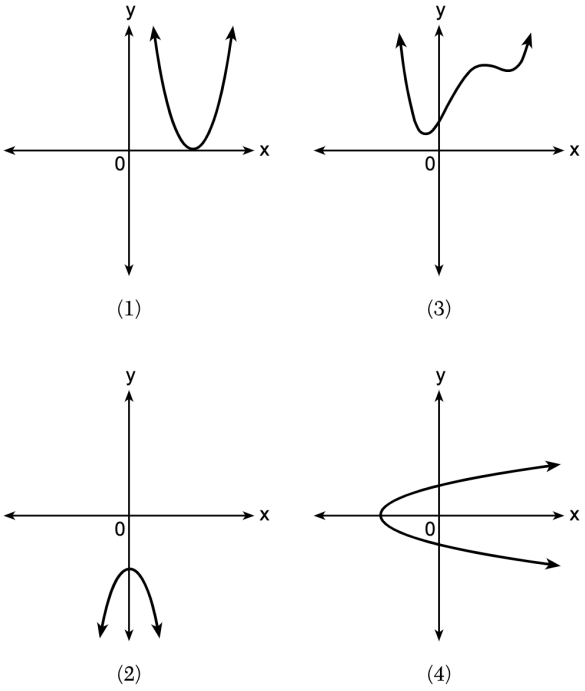
(a) $f(x) = (x - a)(x^2 + b)$

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

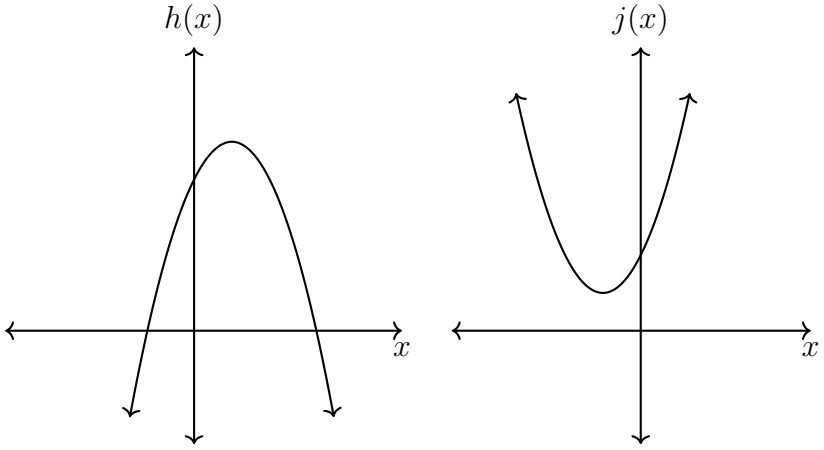
(c) $f(x) = (a - x^2)(x^2 + b)$

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

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



14. 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.



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 $j(x)$

15. Algebraically determine the zeros of the function below.

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

16. Factor completely the expression $-2x^4 + x^3 + 18x^2 - 9x$

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

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

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

Jan 2020 Regents problems: Exponential functions

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