

Review B: (Topics 1.7 – 1.11) Rational Functions

Directions: Determine if the following rational functions have a horizontal asymptote, slant asymptote, or neither.

1. $f(x) = \frac{2x^2 - 3x + 1}{x^3 + 1}$

2. $g(x) = \frac{x^2 + x - 5}{3x^2 - 2x + 1}$

3. $h(x) = \frac{x^3 + 4x^2 + 5x - 6}{3x^2 - 7}$

4. $k(x) = \frac{-2x^4 + 3x^3 + 8}{x^2 - 6x - 11}$

5. $r(x) = \frac{(2x+1)(3x-4)}{(x+3)(x-1)}$

6. $y = \frac{(x-1)^3(2x+3)^2}{(x-2)^2(x+4)^5}$

7. $y = \frac{(x-1)^4}{-3x(x-8)^2}$

8. $y = \frac{(x^2+1)^2}{5x^2(x+2)}$

9. $y = \frac{6}{x+3}$

Directions: Solve the following inequalities. Write your answers in interval notation.

10. $\frac{x-2}{x+3} \leq 0$

11. $\frac{(x+1)^2}{(x-3)(x+5)} > 0$

12. $\frac{-3x(x-7)}{(x+2)^2} \geq 0$

13. $\frac{x^2 + 3x - 28}{x^2 - 9x} < 0$

Directions: For each of the following rational functions, identify and label any values of x where the function has a hole or vertical asymptote.

$$14. f(x) = \frac{3x(x-6)(x+4)}{(x-1)(x+4)}$$

$$15. g(x) = \frac{(x-3)(x+2)}{(x-3)^2(x-8)}$$

$$16. h(x) = \frac{(x-7)^2(x+1)}{2x(x-7)}$$

$$17. k(x) = \frac{x^2 - 4x - 12}{x^2 - 12x + 36}$$

$$18. r(x) = \frac{x^2 - 9}{x^3 + x^2 - 6x}$$

$$19. y = \frac{(x+3)^5(x-5)^3}{(x+3)^3(x-5)^5}$$

Directions: Write the equation of the horizontal or slant asymptote for each of the following rational functions.

$$20. f(x) = \frac{x^2 + 4x - 11}{3x^2 - 2x + 3}$$

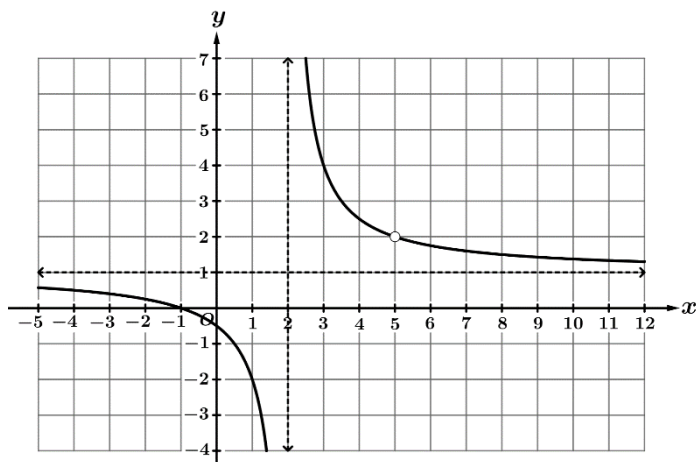
$$21. g(x) = \frac{4x^3 + 13}{2x^4 - x^3 - 9}$$

$$22. h(x) = \frac{4x^2 - 3x + 5}{x + 2}$$

$$23. k(x) = \frac{x^3 - 2x^2 + 4x - 1}{x^2 + x + 3}$$

$$24. y = \frac{2x(x-4)(x+3)}{(x-7)^3}$$

$$25. y = \frac{-3x^2(x+4)^2}{(x+1)^2(x-1)^3}$$



Graph of $f(x)$

26. The graph of the rational function f is shown above. Which of the following could be an expression for $f(x)$?

(A) $\frac{(x+1)(x-2)}{(x-2)(x-5)}$

(B) $\frac{(x+1)(x-5)}{(x-2)(x-5)}$

(C) $\frac{(x-1)(x+5)}{(x+2)(x+5)}$

(D) $\frac{(x+1)(x-5)}{(x-1)(x-2)}$

27. The graph of the rational function k has a hole at $x = 3$ and a vertical asymptote at $x = -2$. Which of the following could be k ?

(A) $k(x) = \frac{(x-3)(x-2)}{(x-3)(x+2)}$

(B) $k(x) = \frac{(x-2)(x+2)}{(x-3)(x+2)}$

(C) $k(x) = \frac{(x-3)(x+2)}{(x-3)(x-2)}$

(D) $k(x) = \frac{(x-3)(x+2)}{(x-2)(x+2)}$

28. Let $g(x) = \frac{(x-2)^3(x+1)^2}{(x-2)^2(x+1)^4}$. Which of the following statements about g is correct?

- (A) The graph of g has a vertical asymptote at $x = 2$ and a horizontal asymptote of $y = 1$.
- (B) The graph of g has a vertical asymptote at $x = -1$ and a horizontal asymptote of $y = 2$.
- (C) The graph of g has a vertical asymptote at $x = 2$ and a horizontal asymptote of $y = -1$.
- (D) The graph of g has a vertical asymptote at $x = -1$ and a horizontal asymptote of $y = 0$.

29. Let $h(x) = \frac{(x-2)^5 - x^5}{3x^4}$. Which of the following statements about the graph of h is correct?

- (A) The graph of h has a horizontal asymptote of $y = \frac{1}{3}$.
- (B) The graph of h has a horizontal asymptote of $y = \frac{5}{3}$.
- (C) The graph of h has a horizontal asymptote of $y = -\frac{2}{3}$.
- (D) The graph of h has a horizontal asymptote of $y = -\frac{10}{3}$.
- (E) The graph of h does not have a horizontal asymptote.

30. Let $r(x) = \frac{x^2 + x - 6}{x^3 - 5x^2 + 6x}$. Which of the following values of x are zeros on the graph of r ?

- (A) $x = 2$ only
- (B) $x = -3$ only
- (C) $x = 0$ and $x = 3$ only
- (D) $x = 0, x = 2,$ and $x = 3$