Unit 3 Rational Functions

Multiple Choice - Identify the choice that best completes the statement or answers the question.

1. Find the \( y \)-intercept and asymptotes of the rational function \( r(x) = \frac{x^2 - 5x - 50}{(x - 5)^2} \).

   a. \( y \)-intercept   horizontal asymptote   vertical asymptote
      (0, -2)   \( y = 1 \)   \( x = 5 \)
   b. \( y \)-intercept   horizontal asymptote   vertical asymptote
      (0, 2)   \( y = 1 \)   \( x = -5 \)
   c. \( y \)-intercept   horizontal asymptote   vertical asymptote
      (0, -2)   \( \text{Does Not Exist} \)   \( x = -5 \)
   d. \( y \)-intercept   horizontal asymptote   vertical asymptote
      (0, 5)   \( y = 0 \)   \( x = 25 \)
   e. \( y \)-intercept   horizontal asymptote   vertical asymptote
      (0, 10)   \( y = 0 \)   \( x = 5 \)

Short Answer

2. Find the zero(s), \( y \)-intercept, and asymptotes of the rational function \( r(x) = \frac{5x + 120}{-4x + 8} \).

3. Find the \( x \)- and \( y \)-intercepts of the rational function \( r(x) = \frac{x - 18}{x + 6} \).

Determine the equations of any vertical asymptotes and the values of \( x \) for any holes in the graph of the rational function.

4. \( f(x) = \frac{3}{x^2 - 14x + 48} \)

Determine the equations of any vertical asymptotes and the values of \( x \) for any holes in the graph of the rational function.

5. \( f(x) = \frac{x - 6}{x^2 - 7x + 6} \)

6. Describe the vertical asymptote(s) and hole(s) for the graph of \( y = \frac{(x - 5)(x - 2)}{(x - 2)(x + 4)} \).

7. Find the horizontal asymptote of the graph of \( y = \frac{-9x^3 - 6x + 4}{-9x^5 + 6x + 4} \).

8. Find the horizontal asymptote of the graph of \( y = \frac{6x^2 + 5x + 9}{7x^2 - x + 9} \).
9. Find all horizontal and vertical asymptotes (if any).

\[ r(x) = \frac{2x - 4}{x^2 + 10x + 25} \]

(a) Find all horizontal asymptotes (if any).

(b) Find all vertical asymptotes (if any).

(c) Find all holes (if any).

10. Find the intercepts and asymptotes.

\[ s(x) = \frac{5x - 5}{(x - 5)(x + 1)} \]

(a) Determine the zero(s).

(b) Determine the y-intercept(s).

(c) Determine the vertical asymptote(s).

(d) Determine the horizontal asymptote(s).

(e) Determine the holes(s).

(f) State the domain.
MULTIPLE CHOICE
1. D

SHORT ANSWER
2. zero y-int. horiz. asymptote vert. asymptote
   x = -24 (0, 15) \( y = -1.25 \) \( x = 2 \)

3. \( x \)-intercept (18, 0), \( y \)-intercept (0, -3)

4. asymptotes: \( x = 6 \); \( x = 8 \), no holes

   NOTE: If the rational expression of a function is written in simplest form and the function is undefined for \( x = a \), then \( x = a \) is a vertical asymptote.

5. asymptotes: \( x = 1 \); hole: \( x = 6 \)

   NOTE: If the rational expression of a function is written in the simplest form and the function is undefined for \( x = a \), then \( x = a \) is a vertical asymptote. If the function is defined for \( x = a \), then there is a hole in the graph at \( x = a \).

6. asymptote: \( x = -4 \) and hole: \( x = 2 \)

7. \( y = 0 \)

8. \( y = \frac{6}{7} \)

9. (A) \( y = 0 \)
   (B) \( x = -5 \)
   (C) No holes

10. (A) \( x = 1 \)
    (B) (0,1)
    (C) \( x = -1, x = 5 \)
    (D) \( y = 0 \)
    (E) No holes
    (F) (\(-\infty, -1\), \(-1,5\), (5,\(\infty\)))