Honors Pre-Calculus

Chapter 2, Section 6

Identify the vertical asymptotes of each general rational function from its equation. Verify using a graphing utility.

1) \( f(x) = \frac{x^2 - 5x + 4}{x^2 + x - 6} \)

2) \( f(x) = \frac{-2x + 2}{x + 3} \)

Identify the horizontal asymptote of each general rational function from its equation. Verify using a graphing utility.

3) \( f(x) = \frac{3x + 9}{x + 4} \)

4) \( f(x) = \frac{3}{x^2 + x - 6} \)

Identify the slant asymptote of each rational function from its equation. Verify using a graphing utility.

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

6) \( f(x) = \frac{x^2 + 3x + 2}{x - 2} \)

Identify the location of the hole in the graph of each rational function from its equation. Verify using a graphing utility.

7) \( y = \frac{(x - 1)(x + 3)}{2(x - 1)(x - 5)} \)

8) \( y = \frac{x^2 - 1}{x^2 + 3x + 2} \)

Identify the \( x \)-intercepts of each general rational function from its equation. Verify using a graphing utility.

9) \( f(x) = \frac{x^2 - 2x - 8}{3x - 9} \)

10) \( f(x) = \frac{4}{x^2 - 2x - 3} \)

Identify the \( y \)-intercept of the graph of each general rational function from its equation. Verify using a graphing utility.

11) \( f(x) = \frac{3x - 6}{x - 2} \)

12) \( f(x) = \frac{x^2 - 9}{x} \)

Write the equation of a rational function that has the given properties.

13) Write a rational function \( f \) that has a vertical asymptote at \( x = 1 \), a horizontal asymptote \( y = 2 \) and an \( x \)-intercept of \((4,0)\).

14) Write a rational function \( f \) that has a vertical asymptote at \( x = 0 \) and \( x = 7 \), a horizontal asymptote \( y = 0 \) and does not cross the \( x \)-axis.
Answers to Chapter 2, Section 6

1) Vertical Asym.: \( x = 2, x = -3 \)
2) Vertical Asym.: \( x = -3 \)
3) Horz. Asym.: \( y = 3 \)
4) Horz. Asym.: \( y = 0 \)
5) \( y = 3x + 3 \)
6) \( y = x + 5 \)
7) \( \left(1, \frac{-1}{2}\right) \)
8) \((-1, -2)\)
9) x-intercepts: \((4, 0), (-2, 0)\)
10) x-intercepts: None
11) \((0, 3)\)
12) no \( y \)-intercept
13) \( y = \frac{2(x - 4)}{x - 1} \)
14) \( y = \frac{1}{x(x - 7)} \) note: the numerator can be any constant.