

## Rational Functions

Date \_\_\_\_\_ Period \_\_\_\_\_

Identify the points of discontinuity, holes, vertical asymptotes, x-intercepts, and horizontal asymptote of each.

$$1) f(x) = \frac{3}{x+6}$$

Hole(s) NoneVertical Asymptote(s)  $x = -6$ Horizontal Asymptote  $y = 0$ Slant Asymptote nonex-intercept(s) noney-intercept  $(0, \frac{1}{2})$ 

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

Hole(s) NoneVertical Asymptote(s)  $x = -3, x = 1$ Horizontal Asymptote  $y = 1$ Slant Asymptote Nonex-intercept(s)  $(2, 0), (-1, 0)$ y-intercept  $(0, \frac{2}{3})$ 

$$3) f(x) = \frac{3x^2 + 6x}{x^2 + 5x + 6} = \frac{3x(x+2)}{(x+3)(x+2)}$$

Hole(s)  $(-2, -6)$ Vertical Asymptote(s)  $x = -3$ Horizontal Asymptote  $y = 3$ Slant Asymptote nonex-intercept(s)  $(0, 0)$ y-intercept  $(0, 0)$ 

$$4) f(x) = \frac{2}{x-4}$$

Hole(s) NoneVertical Asymptote(s)  $x = 4$ Horizontal Asymptote  $y = 0$ Slant Asymptote Nonex-intercept(s) Noney-intercept  $(0, -\frac{1}{2})$ 

$$5) f(x) = \frac{x^2 + 2x - 15}{x-3} = \frac{(x+5)(x-3)}{x-3}$$

Hole(s)  $(3, 8)$ Vertical Asymptote(s) NoneHorizontal Asymptote NoneSlant Asymptote  $y = x$ x-intercept(s)  $(-5, 0)$ y-intercept  $(0, 5)$ 

$$6) f(x) = \frac{x^2 - x - 20}{x^2 - 9} = \frac{(x-5)(x+4)}{(x+3)(x-3)}$$

Hole(s) NoneVertical Asymptote(s)  $x = 3, x = -3$ Horizontal Asymptote  $y = 1$ Slant Asymptote Nonex-intercept(s)  $(5, 0), (-4, 0)$ y-intercept  $(0, \frac{2}{9})$

$$7) f(x) = \frac{-2x - 8}{x^2 + 5x + 4} = \frac{-2(x+4)}{(x+4)(x+1)}$$

Hole(s) (-4, 2/3)

Vertical Asymptote(s) x = -1

Horizontal Asymptote y = 0

Slant Asymptote None

x-intercept(s) none

y-intercept (0, -2)

$$9) f(x) = \frac{x^2 + 4x + 3}{3x^2 - 9x} = \frac{(x+3)(x+1)}{3x(x-3)}$$

Hole(s) None

Vertical Asymptote(s) x = 0, x = 3

Horizontal Asymptote y = 1/3

Slant Asymptote None

x-intercept(s) (-3, 0), (-1, 0)

y-intercept None

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

Hole(s) None

Vertical Asymptote(s) x = 2, x = -2

Horizontal Asymptote y = 0

Slant Asymptote None

x-intercept(s) None

y-intercept (0, -1/2)

$$8) f(x) = \frac{-6x + 5}{3x - 6} = \frac{-6x + 5}{3(x-2)}$$

Hole(s) None

Vertical Asymptote(s) x = 2

Horizontal Asymptote y = -2

Slant Asymptote None

x-intercept(s) (5/6, 0)

y-intercept (0, -5/6)

$$10) f(x) = \frac{x^2 - 7x + 12}{x^2 - 5x + 4} = \frac{(x-4)(x-3)}{(x-4)(x-1)}$$

Hole(s) (4, 1/3)

Vertical Asymptote(s) x = 1

Horizontal Asymptote y = 1

Slant Asymptote None

x-intercept(s) (3, 0)

y-intercept (0, 3)

$$12) f(x) = \frac{-x + 2}{x + 2}$$

Hole(s) None

Vertical Asymptote(s) x = -2

Horizontal Asymptote y = -1

Slant Asymptote None

x-intercept(s) (2, 0)

y-intercept (0, 1)