

## 9.2 Notes: Graphing Rational Functions Day 3

## Objectives:

- Be able to find x and y intercepts
- Be able to find VA and HA and make the connection to domain and range
- Be able to recognize and find more than one vertical asymptote within a rational function

Find the key information for each function.

$$1. f(x) = \frac{x-4}{x-1}$$

Vertical asymptote:  $x=1$

Horizontal asymptote:  $y=1$

x-intercept:  $(4,0)$

$$(x-1)0 = \frac{x-4}{x-1} (x-1)$$

$$0 = x-4$$

$$x=4$$

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

Vertical asymptote:  $x=-3$

Horizontal asymptote:  $y=2$

x-intercept:  $(2,0)$

$$(x+3)0 = \frac{2x-4}{x+3} (x+3)$$

$$0 = 2x-4$$

$$x=2$$

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

Vertical asymptote:  $x=5$

Horizontal asymptote:  $y=1$

x-intercept:  $(-2,0)$

$$(x-5)0 = \frac{x+2}{x-5} (x-5)$$

$$0 = x+2$$

$$x=-2$$

Domain:  $(-\infty, 1) \cup (1, \infty)$

Range:  $(-\infty, 1) \cup (1, \infty)$

y-intercept:  $(0, 4)$

$$y = \frac{0-4}{0-1} = 4$$

Domain:  $(-\infty, -3) \cup (-3, \infty)$

Range:  $(-\infty, 2) \cup (2, \infty)$

y-intercept:  $(0, -4/3)$

$$y = \frac{2(0)-4}{0+3}$$

$$= \frac{-4}{3}$$

Domain:  $(-\infty, 5) \cup (5, \infty)$

Range:  $(-\infty, 1) \cup (1, \infty)$

y-intercept:  $(0, -2/5)$

$$y = \frac{0+2}{0-5}$$

$$= -\frac{2}{5}$$

$$4. f(x) = \frac{2x+6}{x-4}$$

Vertical asymptote:  $x=4$

Horizontal asymptote:  $y=2$

x-intercept:  $(-3, 0)$

$$(x-4) \cdot 0 = \frac{2x+6}{x-4} (x-4)$$

$$0 = 2x + 6$$

$$\frac{-6}{2} = 2x \quad x = -3$$

$$5. f(x) = \frac{3x-12}{x+6}$$

Vertical asymptote:  $x=-6$

Horizontal asymptote:  $y=3$

x-intercept:  $(4, 0)$

Domain:  $(-\infty, 4) \cup (4, \infty)$

Range:  $(-\infty, 2) \cup (2, \infty)$

y-intercept:  $(0, -1.5)$

$$y = \frac{2(0)+6}{0-4}$$

$$= \frac{6}{-4}$$

Domain:  $(-\infty, -6) \cup (-6, \infty)$

Range:  $(-\infty, 3) \cup (3, \infty)$

y-intercept:  $(0, -2)$

Finding more than one vertical asymptote: FACTOR! (use calc to show the graph)

$$6. f(x) = \frac{2}{x^2-9}$$

$$(x-3)(x+3)$$

Vertical asymptote:  $x=3, -3$

Horizontal asymptote:  $y=0$

$$7. f(x) = \frac{x-1}{x^2+5x+6}$$

$$(x+2)(x+3)$$

Vertical asymptote:  $x=-2, -3$

Horizontal asymptote:  $y=0$