

Feb. 28, 2018

Sect. 6-1

Rational Functions

Defn.

{ Vertical Asymptote
 Domain

Solving

Rational Functions

$$R(x) = \frac{N(x)}{D(x)}$$

e.g. $\frac{2}{x}$

$$\frac{3}{x+5}$$

$$\frac{2x}{x^2-6x+2}$$

Must have a
variable in
the denom.

Finding Vert. Asym.

$$f(x) = \frac{3}{x-2} \quad \underline{x=2} \text{ Bad!}$$

The graph of f has a V.A. @ $x=2$

$$g(x) = \frac{4x}{x^2 - x - 6}$$

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

So V.A. @

$$x=3, x=-2$$

Domain

This is essentially the same as V.A.

$$f(x) = \frac{3}{x-2} \quad D: \{x \mid x \neq 2\}$$

$$\begin{aligned} g(x) &= \frac{4x}{x^2 - x - 6} \\ &= \frac{4x}{(x-3)(x+2)} \end{aligned} \quad D: \{x \mid x \neq -2, 3\}$$

Solving:

$$\frac{3}{x} = \frac{5}{x+2}$$

$$5x = 3(x+2)$$

$$5x = 3x + 6$$

$$2x = 6$$

$$x = 3 \quad * \text{ Checks}$$

$$\frac{3}{x+5} = \frac{2}{x+1} \quad x \neq -5 \quad x \neq -1$$

$$3(x+1) = 2(x+5)$$

$$3x+3 = 2x+10$$

$$x+3 = 10$$

$$x = 7 \quad \checkmark$$

$$x \neq 5 \quad \frac{x}{x-5} = \frac{2x-5}{x-5}$$

$$x^2 - 5x = 2x^2 - 15x + 25$$

$$x^2 - 10x + 25 = 0$$

$$(x-5)^2 = 0$$

$$x-5=0$$

$$x=5 \quad \times \quad \text{No Sol.}$$

But wait:

$$x \neq 5 \quad \frac{x}{x-5} = \frac{2x-5}{x-5}$$

same

$$x = 2x - 5$$

$$-x = -5$$

$$x = 5 \quad \times \quad \text{No Sol.}$$