

**Lesson 38- Objective: SWBAT sketch a rational function.**

**Kickoff- Find the asymptotes and holes for example 1. (on your desk)**

HW

$$\frac{x+2}{x^2-4} \cdot \frac{x-2}{(x-2)(x+2)} = \frac{1}{x+2}$$

VA  $\rightarrow x+2=0$   
 $x=-2$

HA  $\rightarrow \frac{x}{x^2} \rightarrow y=0$

Hole  $x-2=0$   
 $x=2$  (2, 1/4)

$$\frac{1}{2+2} = \frac{1}{4}$$

$$-\frac{x-4}{x^2-16}$$

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

VA  $\rightarrow x+4=0$   
 $x=-4$

$$\frac{x^2-2x}{x^2+7x} \cdot \frac{(x-2)}{(x+7)}$$

VA  $\rightarrow x+7=0$   
 $x=-7$

hole (0, 2/7)

HA  $\rightarrow \frac{x}{x^2}$   
 $y=1$

Sketching Rational Functions (NO CALCULATOR)

Guidelines on Sketching:

- 1) Find and plot the y-intercept
- 2) Find and plot the x-intercept
- 3) Find and sketch the vertical asymptotes (where the denominator = 0) or holes in the graph
- 4) Find and sketch the horizontal asymptotes (see rules from yesterday)
- 5) Find and plot points between and beyond the x-intercepts and vertical asymptotes
- 6) Draw smooth curves between and beyond the asymptotes

\*\*\*\*\* You can cross a horizontal asymptote\*\*\*\*\*

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

VA  $\rightarrow (x-3)(x+2)=0$   
 $x-3=0$   $x+2=0$   
 $x=3$   $x=-2$

Domain:  $x \neq 3, x \neq -2$

Vertical Asymptote(s):  $x=3, x=-2$

Hole(s):  $(2, 0)$

Horizontal Asymptote(s):  $y=0$

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

y-intercept(s):  $(0, 1/3)$

Range (use graph):  $y < 0$  or  $y > 1/3$

Y-int  $\frac{0-2}{(0+2)(0-3)} = \frac{-2}{-6} = \frac{1}{3}$

X-int  $x-2=0$   
 $x=2$

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

$f(-5) = \frac{-5-2}{(-5+2)(-5-2)} = \frac{-7}{(-3)(-7)} = \frac{1}{3}$

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

$f(4) = \frac{4-2}{(4-3)(4+2)} = \frac{2}{(1)(6)} = \frac{1}{3}$

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

$$\frac{2x-4}{x} = \frac{2x}{x} - \frac{4}{x} = 2 - \frac{4}{x}$$

Domain:  $x \neq 0$

Vertical Asymptote(s):  $x=0$

Hole(s):  $(2, 0)$

Horizontal Asymptote(s):  $y=2$

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

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

Range (use graph):  $y < 2$  or  $y > 2$

VA  $\rightarrow x=0$

HA  $\rightarrow \frac{2x}{x} = 2$   
 $y=2$

Undefined!

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

$$\frac{(x+5)(x-1)}{(x+1)(x-1)} = \frac{x+5}{x+1}$$

Domain:  $x \neq -1$

Vertical Asymptote(s):  $x=-1$

Hole(s):  $(-1, 3)$

Horizontal Asymptote(s):  $y=1$

x-intercept(s):  $(-5, 0)$

y-intercept(s):  $(0, 5)$

Range (use graph):  $y < 1$  or  $y > 1$

VA  $\rightarrow x+1=0$   
 $x=-1$

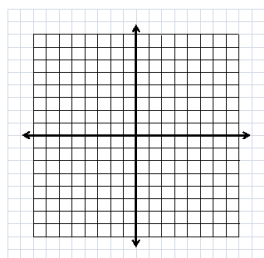
HA  $\rightarrow \frac{x}{x} = 1$   
 $y=1$

hole  $x-1=0$   
 $x=1$

Y-int  $\frac{0+5}{0+1} = 5$

X-int  $\frac{x+5}{x+1} = 0$   
 $x+5=0$   
 $x=-5$

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



- Domain: \_\_\_\_\_
- Vertical Asymptote(s): \_\_\_\_\_
- Hole(s): \_\_\_\_\_
- Horizontal Asymptote(s): \_\_\_\_\_
- x-intercept(s): \_\_\_\_\_
- y-intercept(s): \_\_\_\_\_
- Range (use graph): \_\_\_\_\_