WARM-UP

Find the domain of the function and identify the asymptotes.

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

Domain: all x, $x \neq 2$
$$2 - x = 0$$
$$-x = -2$$
$$x = 2$$

VA $2 - x = 0$
$$-x = -2$$
$$\boxed{x = 2}$$

HA $f(x) = \dfrac{1x + 2}{-1x + 2}$

$$n = m$$
$$y = \frac{1}{-1} = -1$$

$x = 2$, $y = -1$
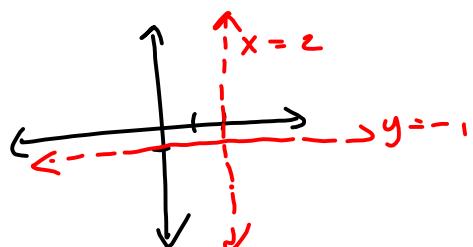
2C.3 Graphing Rational Functions

EX1 Sketch the graph of

$$f(x) = \frac{x+1}{x}$$
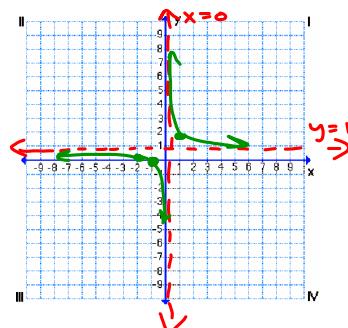
1. Simplify f
   (GCF, factoring, etc.)

2. y-intercepts
   $(x=0)$
   solve $f(0)$
   $f(0) = \frac{0+1}{0} = \frac{1}{0}$
   NONE

3. x-intercepts (zeros)
   Set $N(x) = 0$
   $x + 1 = 0$
   $x = -1$
   $(-1, 0)$

4. VA
   Set $D(x) = 0$
   $x = 0$
   $\boxed{x = 0}$

5. HA
   compare degrees
   $n = 1$, $m = 1$
   so, $n = m$
   $y = 1$

6. Additional Points
   choose x's

x	$y = \frac{x+1}{x}$	
-2	$\frac{-2+1}{-2} = \frac{1}{2}$	$(-2, \frac{1}{2})$
1	$\frac{1+1}{1} = 2$	$(1, 2)$

7. connect the graph using smooth curves towards the asymptotes

Ex2) Sketch the graph of

$$g(x) = \dfrac{x-2}{x^2-2x-8}$$

(1.) Simplify $g(x)$

$$g(x) = \dfrac{x-2}{(x-4)(x+2)}$$

(2.) y-intercepts

$$g(0) = \dfrac{0-2}{0^2-2(0)-8} = \dfrac{-2}{-8} = \dfrac{1}{4}$$

$$\left(0, \tfrac{1}{4}\right)$$

(3.) x-intercepts

$$x-2=0$$
$$x=2$$

$$(2,0)$$

(5.) HA. $n=1, m=2$

$$n < m$$

$$\boxed{y=0}$$

(4.) VA

$$(x-4)(x+2)=0$$
$$x-4=0 \qquad x+2=0$$
$$\boxed{x=4} \qquad \boxed{x=-2}$$

6.) Additional Points

x	$y = \dfrac{(x-2)}{(x^2-2x-8)}$
-3	$-.7$
-1	$.6$
3	$-.2$
5	$.4$

x = -2   x = 4
y = 0

II   I
III IV
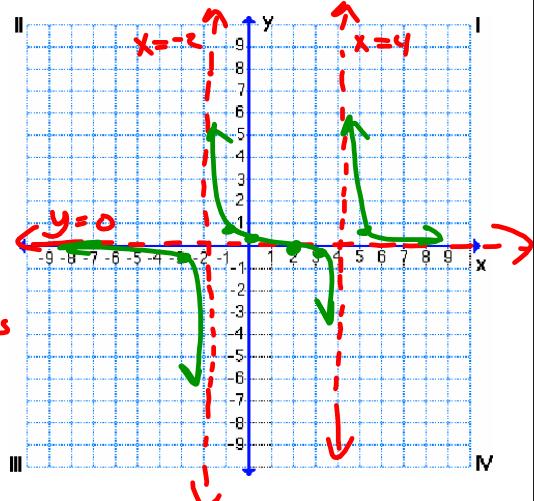
Steps for Graphing Rational Functions

$$\text{Let } f(x) = \dfrac{N(x)}{D(x)}$$

(1.) Simplify f
(factoring, etc.)

(2.) Find y-intercepts by evaluating $f(0)$

(3.) Find x-intercepts by solving $N(x)=0$

(4.) Find VA
set $D(x)=0$
solve

(5.) Find HA
compare degrees

(6.) Additional Points
– choose x's on either side of VA and zeros

(7.) Use smooth curves to complete the graph