Name: _____ Date: _____

PCH: Graphing Rational Functions

Sketch the graph of each rational function. Label all holes and intercepts with their coordinates and any and all asymptotes with their equations. Remember to gather all pertinent information that we discussed in our chart work. Then state the domain of each.

Do Now: Gather as much information as you can about this rational function. (holes, intercepts, even, odd…)

2. $y = \dfrac{x^2 - 1}{x^2 + 1}$

no holes
no VA

HA: $y = 1$

Crosses? No

$\dfrac{x^2-1}{x^2+1} = 1$

$x^2 - 1 \neq x^2 + 1$

x-int: $0 = \dfrac{x^2-1}{x^2+1}$

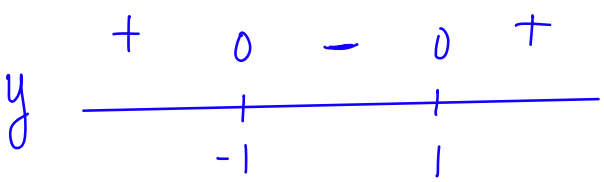
$x^2 - 1 = 0$

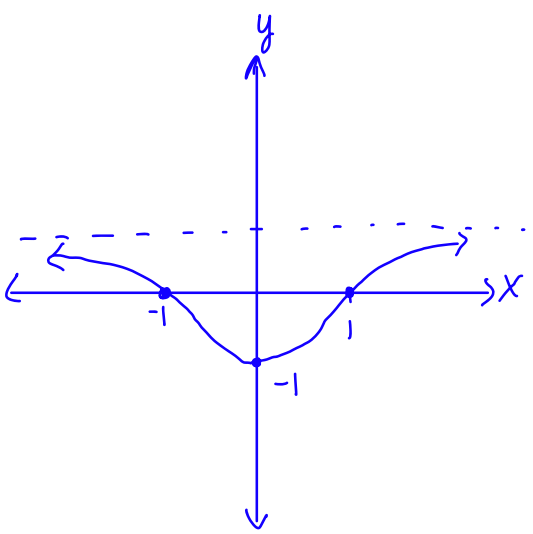
$x = \pm 1$

$(\pm 1, 0)$

y-int: $(0, -1)$

$y = \dfrac{(-x)^2 - 1}{(-x)^2 + 1} = \dfrac{x^2-1}{x^2+1}$ even





D: $(-\infty, \infty)$

R: $[-1, 1)$

4. $y = \frac{x^2+1}{x}$

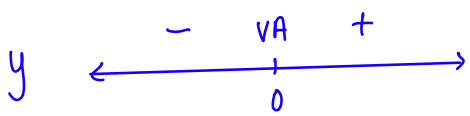
holes
VA: $x = 0$
HA: none
OA: $y = x$
Cross? no
x-int: none
y-int: none
ODD

$x \overline{)\, x^2+1}$ → x, x^2, 1

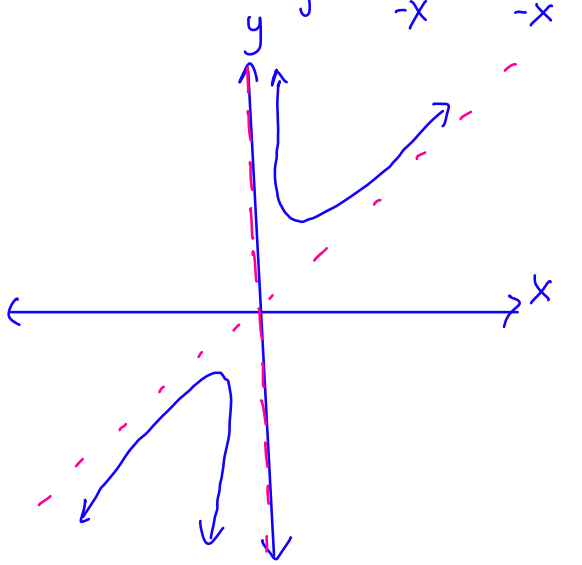
$\frac{x^2+1}{x} = x$

$x^2+1 \neq x^2$

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



$D: \{x \mid x \neq 0\}$



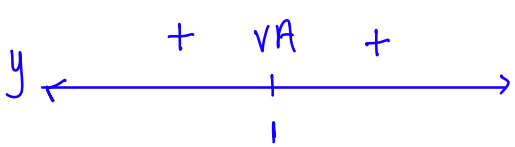
6. $y = \frac{1}{x^2-2x+1}$ $(x-1)^2$

no holes
VA: $x = 1$
HA: $y = 0$
Cross? no
x-int: none
y-int: $(0,1)$
neither

$\frac{1}{(x-1)^2} = 0$

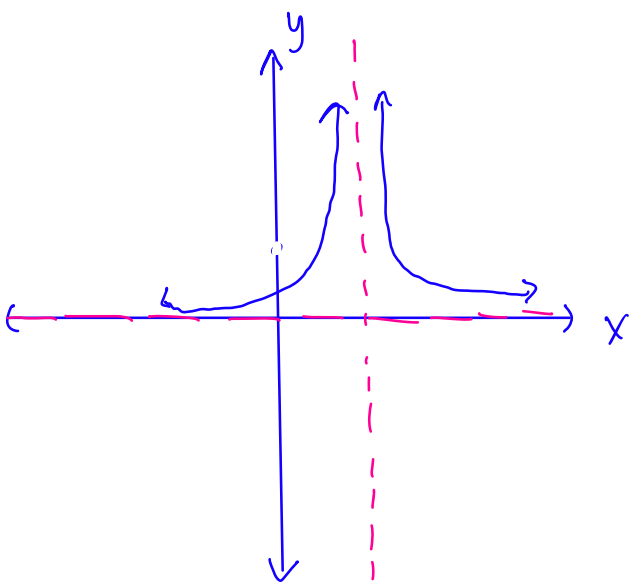
$1 \neq 0$

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



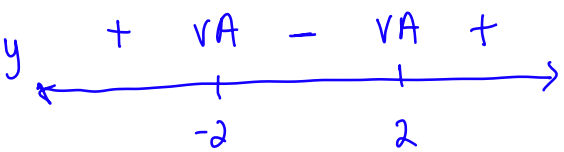
$D: (-\infty, 1) \cup (1, \infty)$

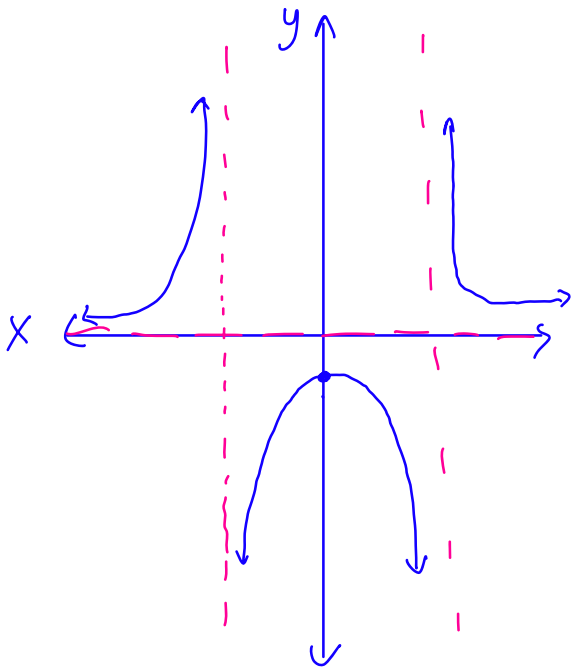
$R: (0, \infty)$



8. $y = \frac{1}{x^2 - 4}$

no holes
VA: $x = \pm 2$
HA: $y = 0$
cross? no
x-int: none
y-int: $(0, -\frac{1}{4})$
even





D: $\{x \mid x \neq \pm 2\}$
R: $(-\infty, -\frac{1}{4}] \cup (0, \infty)$

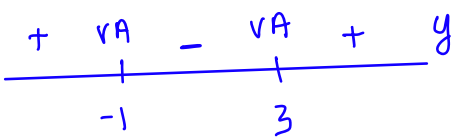
10. $y = \frac{3x^2 + 6}{x^2 - 2x - 3}$

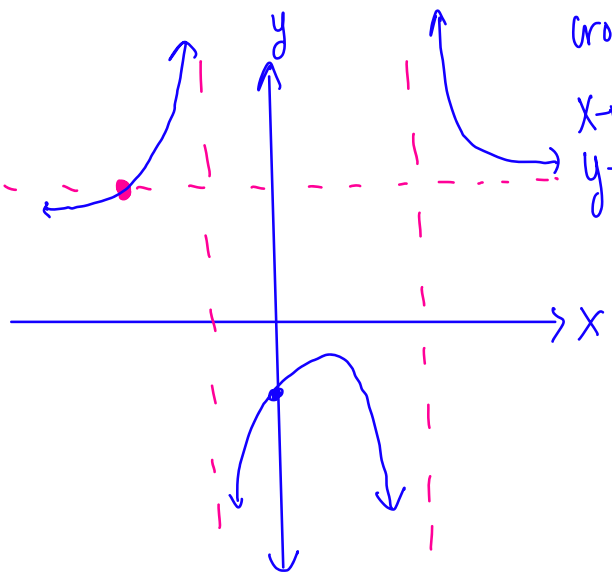
$(x-3)(x+1)$

no holes
VA: $x = 3, -1$
HA: $y = 3$
cross? $(-\frac{5}{2}, 3)$
x-int: none
y-int: $(0, -2)$
neither

$\frac{3x^2+6}{x^2-2x-3} = 3$

$3x^2 + 6 = 3x^2 - 6x - 9$
$15 = -6x$
$-\frac{5}{2} = x$





D: $\{x \mid x \neq -1, 3\}$

12. $y = \dfrac{x^2 + 2x}{x}$ $= \dfrac{x(x+2)}{x}$

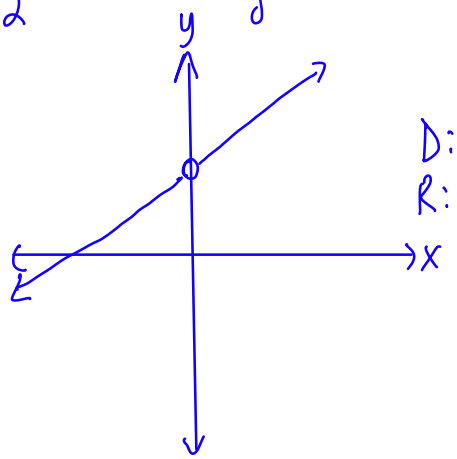
hole: $(0, 2)$

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

y-int: none

} b/c

$y = x + 2$



D: $\{x \mid x \neq 0\}$

R: $\{y \mid y \neq 2\}$

Homework 12-14

Name:_____ Date:_____

PCH: Even More Practice with Asymptotes Ms. Loughran

Function	Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote Does graph intersect the HA?	Oblique Asymptote Does graph intersect the OA?	*x*-intercept(s)	*y*-intercept
$y=\frac{x^2-x-2}{x+1}$ $(x-2)(x+1)$	$(-1,-3)$	none	none	none	$x-2=0$ $x=2$ $(2,0)$	$y=0-2$ $(0,-2)$
$y=\frac{x+3}{x^2+9}$	none	none	$y=0$ $\frac{x+3}{x^2+9}=0$ $x+3=0$ $x=-3$ $(-3,0)$	none	$(-3,0)$	$(0,\frac{1}{3})$
$y=\frac{x^2-x-6}{x^2-x-20}$ $(x-3)(x+2)$ $(x-5)(x+4)$	none	$x=5,-4$	$y=1$ $\frac{x^2-x-6}{x^2-x-20}=1$ $x^2-x-6=x^2-x-20$ no	none	$(3,0)$, $(-2,0)$	$(0,\frac{3}{10})$
$y=\frac{x^2-2x-15}{x-5}$ $(x-5)(x+3)$	$(5,8)$	none	none	none	$0=x+3$ $(-3,0)$	$(0,3)$
$y=\frac{x+3}{2x}$	none	$x=0$	$y=\frac{1}{2}$ $\frac{x+3}{2x}=\frac{1}{2}$ $2x+6=2x$ $6\neq 0$ no	none	$(-3,0)$	none
$y=\frac{x^2-3x}{3x^2+6x}$ $x(x-3)$ $3x(x+2)$	$(0,-\frac{1}{2})$	$x=-2$	$y=\frac{1}{3}$ $\frac{x-3}{3x+6}=\frac{1}{3}$ $3x+6=3x-9$ no	none	$(3,0)$	none b/c of hole

Function	Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote Does graph intersect the HA?	Oblique Asymptote Does graph intersect the OA?	*x*-intercept(s)	*y*-intercept
$y=\frac{x^2-x-6}{2x^2-5x-3}$ $\frac{(x-3)(x+2)}{(2x+1)(x-3)}$	$(3,\frac{5}{7})$	$x=-\frac{1}{2}$	$y=\frac{1}{2}$ $\frac{x+2}{2x+1}=\frac{1}{2}$ $2x+1\neq 2x+4$ no	none	$(-2,0)$	$(0,2)$
$y=\frac{x^2-1}{2x^2+x-1}$ $\frac{(x-1)(x+1)}{(2x-1)(x+1)}$	$(-1,\frac{2}{3})$	$x=\frac{1}{2}$	$y=\frac{1}{2}$ $\frac{x-1}{2x-1}=\frac{1}{2}$ $2x-2\neq 2x-1$ no	none	$(1,0)$	$(0,1)$
$y=\frac{x^3-12x^2+32x}{x^2-2x-8}$ $\frac{x(x-4)(x-8)}{(x-4)(x+2)}$	$(4,-\frac{8}{3})$	$x=-2$	none	$y=x-10$ $\frac{x(x-8)}{x+2}=x-10$ $x^2-8x=x^2-8x-20$ $0\neq -20$ no	$(0,0)$, $(8,0)$	$(0,0)$
$y=\frac{x^2-9x+14}{x^2+3x+2}$ $\frac{(x-7)(x-2)}{(x+2)(x+1)}$	none	$x=-2,1$	$y=1$ $\frac{(x-7)(x-2)}{(x+2)(x+1)}=1$ $x^2-9x+14=x^2+3x+2$ $-12x=-12$ $x=1$ $(1,1)$	none	$(7,0)$, $(2,0)$	$(0,7)$
$y=\frac{5+2x^2}{2-x-x^2}$ $-(x^2+x-2)$ $-(x+2)(x-1)$	none	$x=-2,1$	$y=-2$ $\frac{5+2x^2}{2-x-x^2}=-2$ $5+2x^2=-4+2x+2x^2$ $9=2x$ $\frac{9}{2}=x$ $(\frac{9}{2},-2)$	none	none	$(0,\frac{5}{2})$
$y=\frac{x^2-x-6}{x^3-4x^2-7x+10}$ $\frac{(x-3)(x+2)}{(x-1)(x-5)(x+2)}$	$(-2,\frac{-5}{21})$	$x=1,5$	$y=0$ $\frac{x-3}{(x-1)(x-5)}=0$ $x-3=0$ $x=3$ $(3,0)$	none	$(3,0)$	$(0,-\frac{3}{5})$