

Name: _____

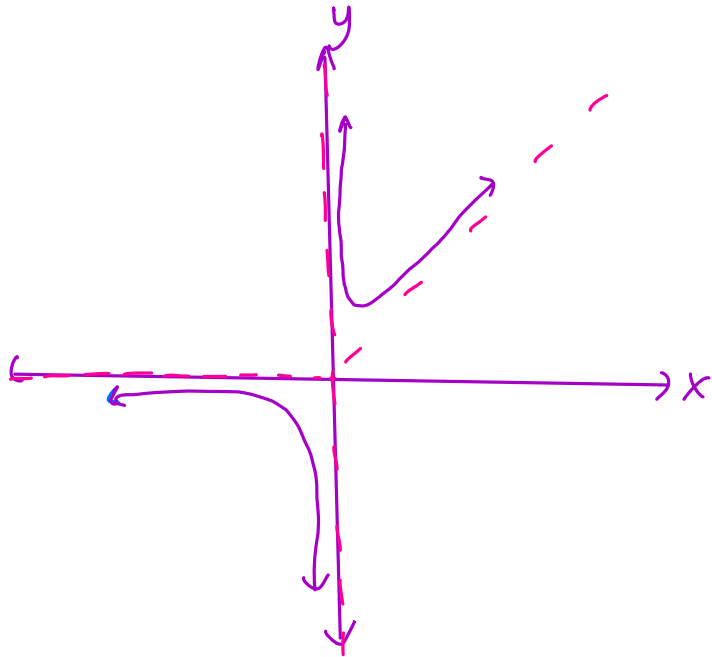
Date: _____

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 #1 from 12-15 sheet

$$14. y = \begin{cases} \frac{x^2+1}{x} & \text{if } x > 0 \\ \frac{1}{x} & \text{if } x < 0 \end{cases}$$



$x > 0$

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

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

$$\begin{array}{r} x \\ x \overline{) x^2 + 1} \\ \underline{x^2} \\ 1 \end{array}$$

$$y \quad \frac{\text{VA} \quad +}{0}$$

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

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

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

$x < 0$

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

no holes
 VA: $x=0$
 HA: $y=0$
 cross? no
 x-int: none
 y-int: none

$$\frac{- \quad \text{VA}}{0}$$

$$\frac{1}{x} = 0$$

Do Now: 2

Solve: $\frac{x+2}{3} = \frac{2x-4}{2}$

$$6x - 12 = 2x + 4$$

$$4x = 16$$

$$x = 4$$

algebraically

Solve each rational equation graphically:

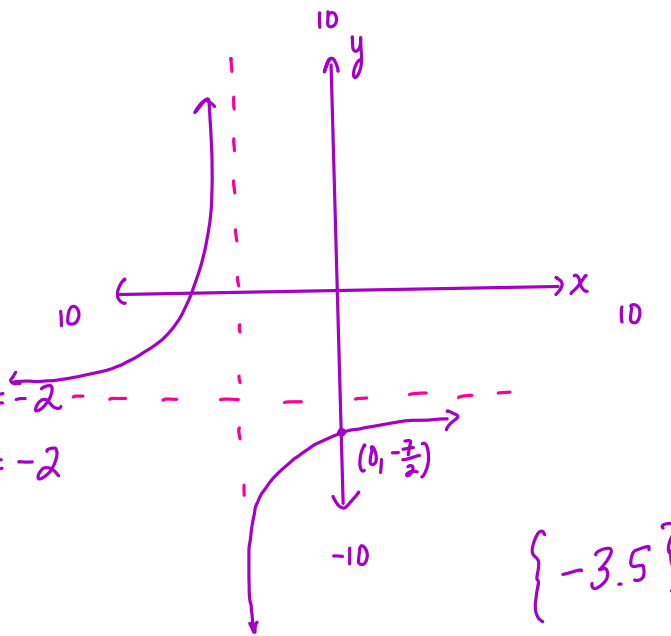
- a) Sketch a complete graph of the function showing all intercepts and asymptotes
- b) Write the window settings you use on the calculator
- c) Find the solution set of the given equation (Round answers to 3 decimal places)

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

$$\frac{x-1}{x+2} - 3 = 0$$

$$y = \frac{x-1}{x+2} - 3$$

possible vertical asymptotes: (PVA) $x = -2$
end behavior: (EB): $y = 1 - 3 = -2$



$$2) \frac{1}{x} - \frac{2}{x-3} = 4$$

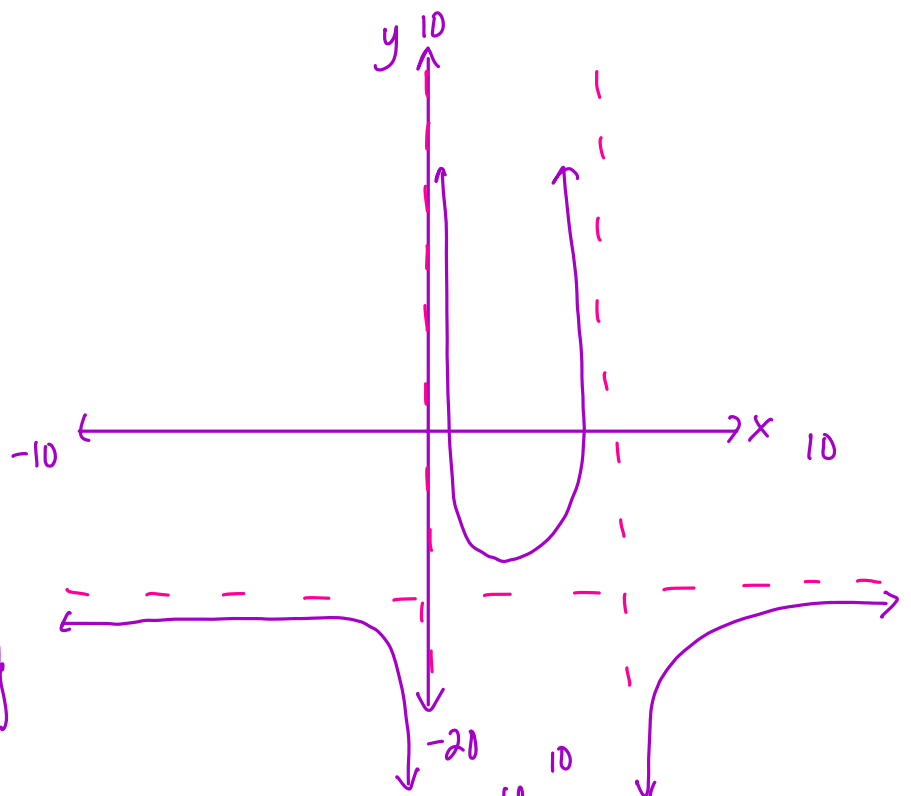
$$\frac{1}{x} - \frac{2}{x-3} - 4 = 0$$

$$y = \frac{1}{x} - \frac{2}{x-3} - 4$$

$$\text{PVA: } x=0, 3$$

$$\text{EB: } y = 0 - 0 - 4 = -4$$

$$\{.307, 2.443\}$$



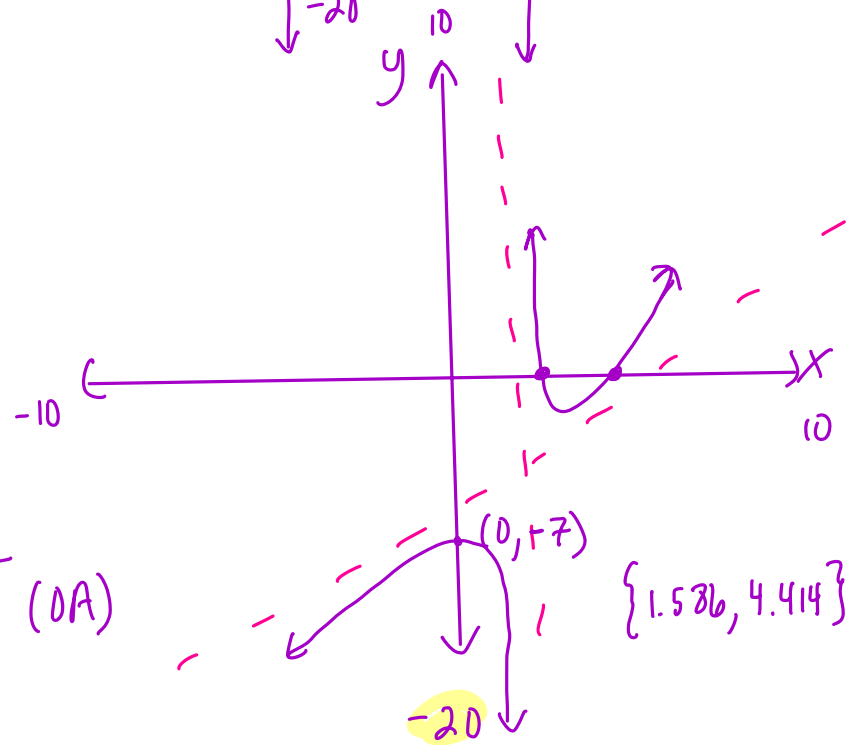
$$3) \frac{2}{x-1} + x = 5$$

$$\frac{2}{x-1} + x - 5 = 0$$

$$y = \frac{2}{x-1} + x - 5$$

$$\text{PVA: } x=1$$

$$\text{EB: } y = 0 + x - 5 = x - 5 \text{ (OA)}$$



$$4) \frac{3}{x-1} + \frac{2}{x} = 8$$

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

$$6) \frac{x-3}{x} - \frac{3}{x+1} + \frac{3}{x^2+x} = 0$$

Steps to solving rational equations graphically:

1. set it = 0 to
find PVA and EB
2. input into y =
(using $\boxed{\text{alpha}}$ $\boxed{y=}$ helps with fraction inputting)
3. calculate zeros of function
(2ND trace, left bound, enter, right bound, enter,
guess, enter)

Also don't forget y-intercept
(2ND table x=0)

Homework 12-21

Name: _____
 PCH: Matching Rational Functions

Date: _____
 Ms. Loughran

In Exercises 1-10, match the rational function with the correct graph.

F 1. $f(x) = \frac{2}{x+1}$ VA: $x = -1$ HA: $y = 0$
 X-int: none Y-int: $(0, 2)$

A 3. $f(x) = \frac{x+1}{x}$ VA: $x = 0$ X-int: $(-1, 0)$
 HA: $y = 1$ Y-int: none

J 5. $f(x) = \frac{2-x}{x-1}$ VA: $x = 1$ X-int: $(2, 0)$
 HA: $y = -1$ Y-int: $(0, 2)$

C 7. $f(x) = \frac{x-2}{x-1}$ VA: $x = 1$ X-int: $(2, 0)$
 HA: $y = 1$ Y-int: $(0, 2)$

H 9. $f(x) = \frac{x^2+1}{x}$ VA: $x = 0$ OA: $y = x$
 HA: none X-int: none
 Y-int: none

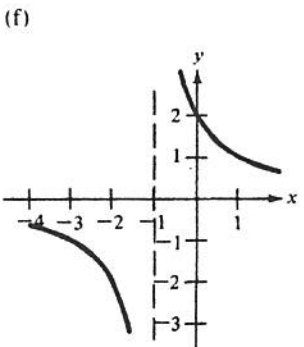
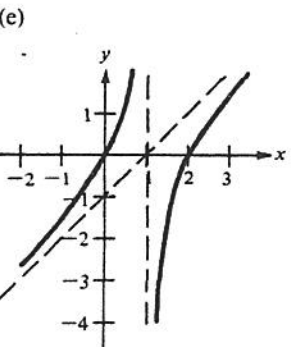
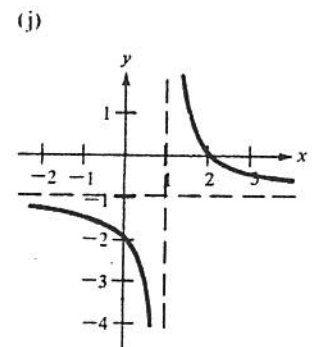
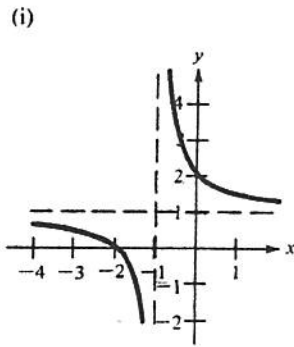
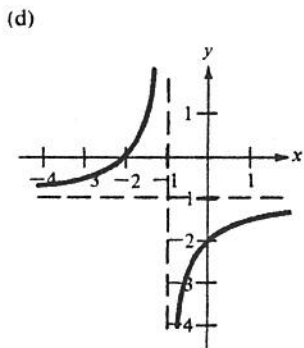
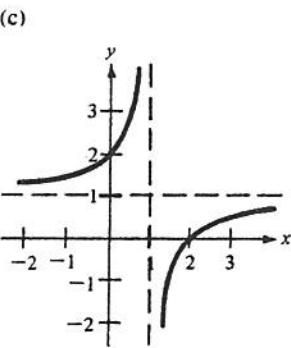
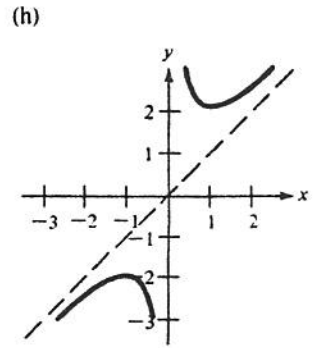
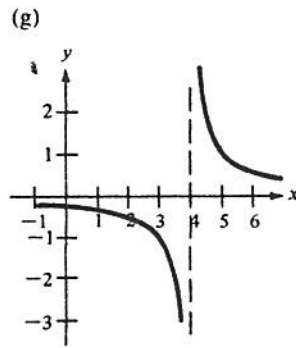
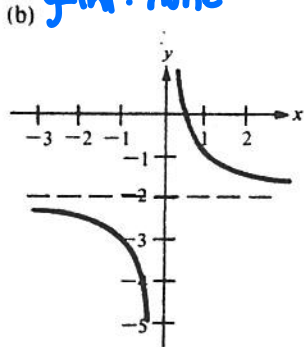
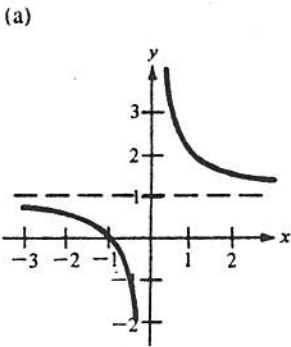
G 2. $f(x) = \frac{1}{x-4}$ VA: $x = 4$ X-int: none
 HA: $y = 0$ Y-int: $(0, -\frac{1}{4})$

B 4. $f(x) = \frac{1-2x}{x}$ VA: $x = 0$ X-int: $(\frac{1}{2}, 0)$
 HA: $y = -2$ Y-int: none

I 6. $f(x) = \frac{x+2}{x+1}$ VA: $x = -1$ X-int: $(-2, 0)$
 HA: $y = 1$ Y-int: $(0, 2)$

D 8. $f(x) = \frac{-x+2}{x+1}$ VA: $x = -1$ X-int: $(-2, 0)$
 HA: $y = -1$ Y-int: $(0, 2)$

E 10. $f(x) = \frac{x^2-2x}{x-1}$ VA: $x = 1$ X-int: $(0, 0), (2, 0)$
 HA: none Y-int: $(0, 0)$
 OA: $y = x - 1$



Practice Exercises:

Solve each of the following graphically. Be sure to sketch a graph indicating any asymptotes and intercepts.

1. $\frac{4}{x} + \frac{1}{3x} = 9$

2. $\frac{3}{n+1} = \frac{5}{n-3}$

3. $\frac{2}{x+5} - \frac{3}{x-4} = \frac{6}{x}$

4. $\frac{1}{x-5} + \frac{1}{x-5} = \frac{4}{x^2-25}$

5. $\frac{6x^2+5x-11}{3x+2} = \frac{2x-5}{5}$

6. $\frac{3}{x-1} - \frac{4}{x-2} = \frac{2}{x+1}$

7. $\frac{x}{x^2-4x-12} = \frac{x+1}{6-x} - \frac{x-3}{2+x}$

8. $\frac{c+2}{c-5} = \frac{7}{c+2}$

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

Name: _____
PC: Vertical and Horizontal Asymptotes

Date: _____
Ms. Loughran

Do Now:

1. Graph $y = \frac{x^4 - 2x^2 + 1}{x^2 - 1}$. State the domain, range coordinates of any hole(s), x - and y -intercepts and the equations of any asymptotes.

Let r be the **REDUCED** rational function

$$r(x) = \frac{a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0}{b_m x^m + b_{m-1} x^{m-1} + \dots + b_1 x + b_0}$$

1. The vertical asymptotes of r are the lines $x = a$, where a is a zero of the denominator.

In other words:

2. (a) If $n < m$, then r has a horizontal asymptote of $y = 0$.

In other words:

- (b) If $n = m$, then r has a horizontal asymptote of $y = \frac{a_n}{b_m}$.

In other words:

- (c) If $n > m$, then r has no horizontal asymptote.

In other words:

Function	Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	x-intercept(s)	y-intercept
$y = \frac{1-x}{x+3}$					
$y = \frac{x-2}{x^2-4}$					
$y = \frac{x^2-x-20}{x+4}$					
$y = \frac{x^2-x-20}{x+1}$					
$y = \frac{2x^3}{x^3+x}$					
$y = \frac{x-1}{x^2-4}$					

More Asymptotes and Holes

Function	Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	x-intercept(s)	y-intercept
$y = \frac{4x}{x-3}$					
$y = \frac{5x^2}{3+x}$					
$y = \frac{-4x^2}{(x-2)(x+4)}$					
$y = \frac{-4+x^2}{(x-2)(x+4)}$					
$y = \frac{3x(x-1)}{2x^2-5x+3}$					
$y = \frac{x}{x^4-1}$					