

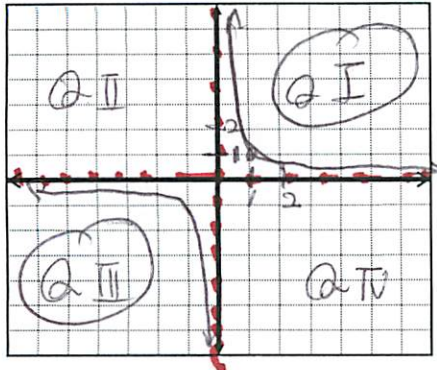
Name: Key Per. _____ Date: _____

Algebra 2B/ Trig.

Unit 5. Rational Functions

Unit Test Review

1) Sketch the graph of $f(x) = \frac{1}{x}$



State each and label them on the graph

a) Intercepts: NA

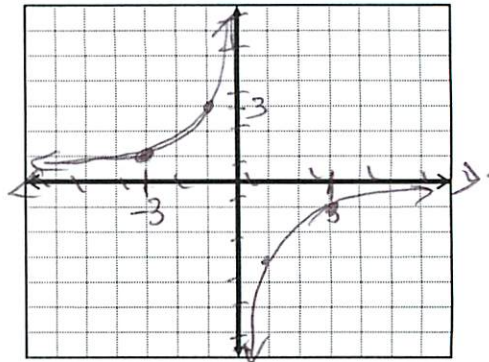
b) Asymptotes: $x=0$; $y=0$

c) Domain: $(-\infty, 0) \cup (0, \infty)$

d) Range: $(-\infty, 0) \cup (0, \infty)$

e) In which quadrant(s) does the graph exist? Q2 and Q3

2) Sketch the graph of $g(x) = -\frac{3}{x}$



State each and label them on the graph

a) Intercepts: NA

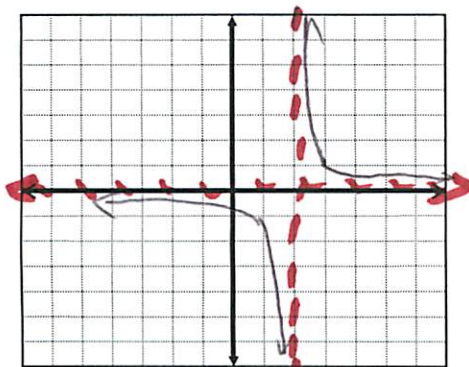
b) Asymptotes: $x=0$; $y=0$

c) Domain: $(-\infty, 0) \cup (0, \infty)$

d) Range: $(-\infty, 0) \cup (0, \infty)$

e) In which quadrant(s) does the graph exist? Q2 & Q4

3) Sketch the graph of $h(x) = \frac{1}{x-2}$

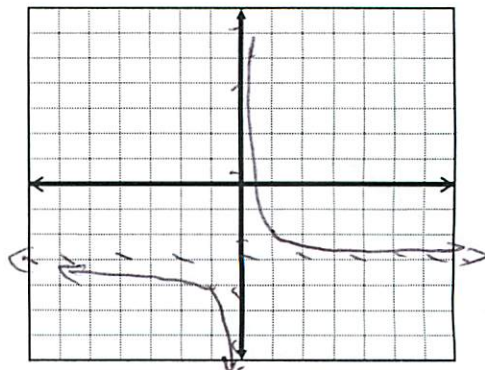


Describe the transformation of the graph

from the parent graph $F(x) = \frac{1}{x}$

horizontal translation 2 unit to the right

4) Sketch the graph of $j(x) = \frac{1}{x} - 3$



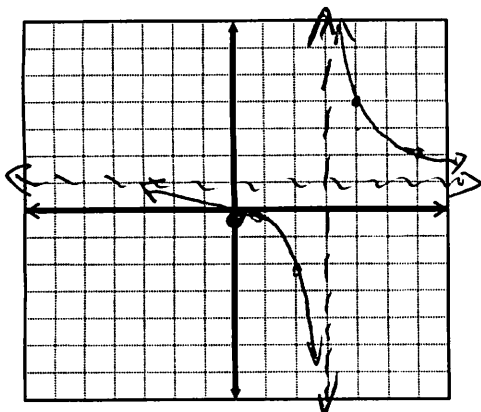
Describe the transformation of the graph

from the parent graph $F(x) = \frac{1}{x}$

vertical trans. 3 units down

5) Sketch the graph and label a-e

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



State each and label them on the graph above

a) x-intercept: $0 = \frac{x}{x-3} \Rightarrow x=0$
 (x int: 0) (0,0)

b) y-intercept(s): $y = \frac{0}{-3} = 0$
 (y int: 0) (0,0)

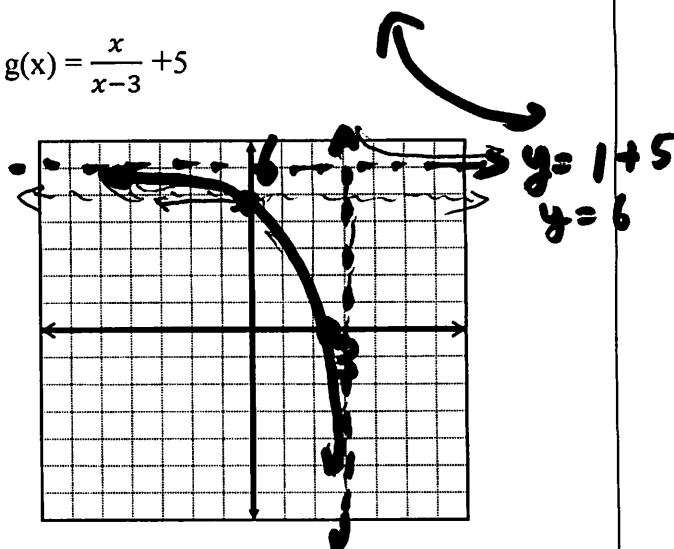
c) Vertical Asymptote: x=3

d) Horizontal Asymptote: y=1

e) Domain: $(-\infty, 3) \cup (3, \infty)$

6) Sketch the graph and label a-e

$$g(x) = \frac{x}{x-3} + 5$$



State each and label them on the graph above

a) x-intercept: $0 = \frac{x}{x-3} + 5 \Rightarrow x = 2\frac{1}{2}$
 x int: 2.5

b) y-intercept(s): $y = \frac{0}{0-3} + 5 = 5$
 y int: 5

c) Vertical Asymptote: x=3

d) Horizontal Asymptote: $y = 1 + 5 \rightarrow$ y=6

e) Domain: $(-\infty, 3) \cup (3, \infty)$

7) Compare and Contrast the graphs on #5 and #6. What are the similarity and difference?

Similarity: both has the same Vertical asymptote
 $x=3$

difference: The vertical asymptotes were different

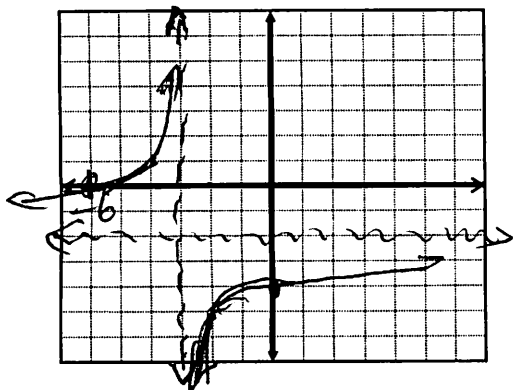
8) State the domain of the function

$$h(x) = \frac{1}{x^2 - 3x - 40}$$

$(x-8)(x+5) \neq 0$
 $x-8 \neq 0 \mid x+5 \neq 0$
 $x \neq 8 \mid x \neq -5$

$(-\infty, -5) \cup (-5, 8) \cup (8, \infty)$

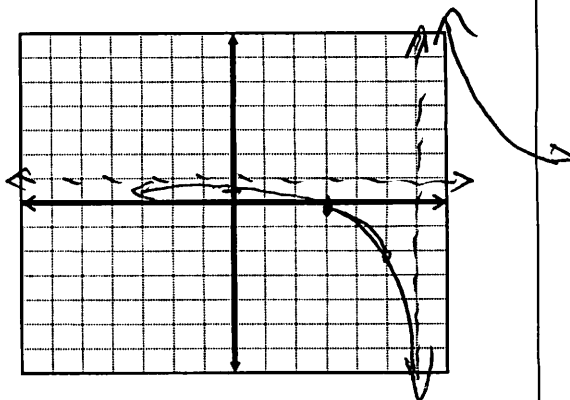
$$9) m(x) = \frac{2x}{x+3} - 4$$



State each and label them on the graph above

- a) Intercepts: $y\text{-int: } -4$, $x\text{-int: } -6$
 $x\text{-int: } 0 = \frac{2x}{x+3} - 4$
b) Asymptotes: VA: $x = -3$, HA: $y = -2$
c) Domain: $(-\infty, -3) \cup (-3, \infty)$
d) Range: $(-\infty, -2) \cup (-2, \infty)$

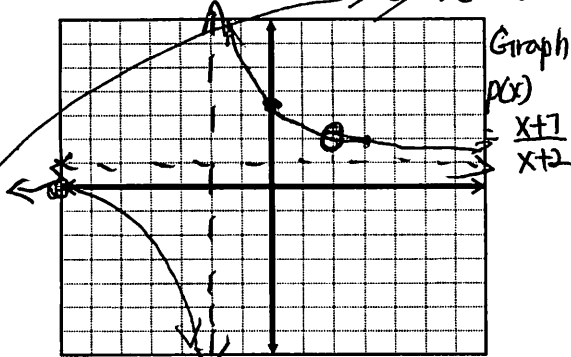
$$10) n(x) = \frac{x-3}{x-6}$$



State each and label them on the graph above

- for $x\text{-int}$, think $(x, 0)$
a) Intercepts: $x\text{-int: } 3$, $y\text{-int: } \frac{1}{2}$
for $y\text{-int}$, think $(0, y)$
b) Asymptotes: VA: $x = 6$, HA: $y = 1$
c) Domain: $(-\infty, 6) \cup (6, \infty)$
d) Range: $(-\infty, 1) \cup (1, \infty)$
e) hole? NA

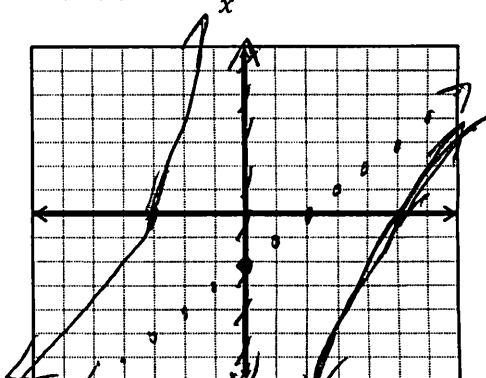
$$11) p(x) = \frac{x^2+5x-14}{x^2-4} = \frac{(x-2)(x+7)}{(x-2)(x+2)}$$



State each and label them on the graph above

- a) Intercepts: $y\text{-int: } \frac{7}{2}$ or $3\frac{1}{2}$, $x\text{-int: } -7$
b) Asymptotes: VA: $x = -2$, HA: $y = 1$
c) Domain: $(-\infty, -2) \cup (-2, \infty)$
d) Range: $(-\infty, 1) \cup (1, \infty)$
e) hole? when $x = 2$

$$12) s(x) = \frac{x^2-2x-15}{x}$$



State each and label them on the graph above

- $x\text{-int: } 5, -3$
a) Intercepts: $y\text{-int: NA}$
b) Asymptotes: VA: $x = 0$, HA: $y = x - 2$
c) Domain: $(-\infty, 0) \cup (0, \infty)$
d) Range: $(-\infty, \infty)$
e) hole? NA

#13-18 Simplify. Be Sure to state restricted values (aka, excluded values), if any

$$13) \frac{x^2-3x-10}{x^2+x-2} \cdot \frac{x^2+3x+2}{(x-5)}$$

$$\frac{\cancel{(x-5)}\cancel{(x+2)}}{\cancel{(x-1)}\cancel{(x+2)}} \cdot \frac{\cancel{(x+2)}(x+1)}{\cancel{(x-5)}}$$

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

Restricted value: 1, -2, 5

$$14) \frac{x^2-3x-10}{x^2+x-2} \div \frac{x+3x+2}{(x-5)}$$

$$\frac{\cancel{(x-5)}(x+2)}{(x+2)\cancel{(x-1)}} \div \frac{(x+2)(x+1)}{\cancel{(x-5)}}$$

$$\frac{\cancel{(x-5)}\cancel{(x+2)}}{\cancel{(x+2)}(x-1)} \cdot \frac{\cancel{(x-5)}}{\cancel{(x+2)}(x+1)}$$

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

RV: -2, 1, -1, 5

$$14) \frac{-3x}{3x-15} + \frac{2x}{(x-5)}$$

$$3(x-5)$$

$$\frac{-3x}{3(x-5)} + \frac{2x \cdot 3}{(x-5) \cdot 3}$$

$$\frac{-3x + 6x}{3(x-5)}$$

$$= \frac{3x}{3(x-5)} = \frac{x}{x-5}$$

RV: 5.

$$15) \frac{-3x}{3x-15} - \frac{2x}{5}$$

$$3(x-5)$$

$$5 \cdot \frac{-3x}{3(x-5)} - \frac{2x \cdot 3(x-5)}{5 \cdot 3(x-5)}$$

$$\frac{-15x - 6x^2 + 30x}{15(x-5)}$$

$$= \frac{-6x^2 + 15x}{15(x-5)}$$

$$= \frac{-3x(2x-5)}{3 \cdot 5(x-5)} = \frac{-x(2x-5)}{5(x-5)}$$

RV: 5

16)

$$\frac{1}{(x-5)} - \frac{x}{(x^2-25)} \cdot \frac{(x-5)(x+5)(2x)}{(x-5)(x+5)(2x)}$$

$$x^2-25 = (x-5)(x+5)$$

$$LCD = (x-5)(x+5)(2x)$$

$$\frac{(x+5)(2x) - x(2x)}{5(x-5)(x+5)}$$

$$= \frac{2x^2 + 10x - 2x^2}{5(x-5)(x+5)} = \frac{10x}{5(x-5)(x+5)}$$

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

RV: 5, -5, 0

17)

$$\frac{x}{(x-5)} - \frac{2x}{(6+\frac{3}{x})}$$

LCD: 2x

$$\frac{x^2-10x}{12x+6}$$

$$= \frac{x(x-10)}{6(2x+1)}$$

RV: 0, -1/2

#19-22, Solve each equation and inequality

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

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

$$1(x+1) - 2(x-3) = 8$$

$$x+1-2x+6=8$$

$$-x+7=8$$

$$-x=1$$

$$x=-1$$

19) $\frac{x}{9-3x} = \left(\frac{1}{x-3}\right)(x-3)(x-3)$

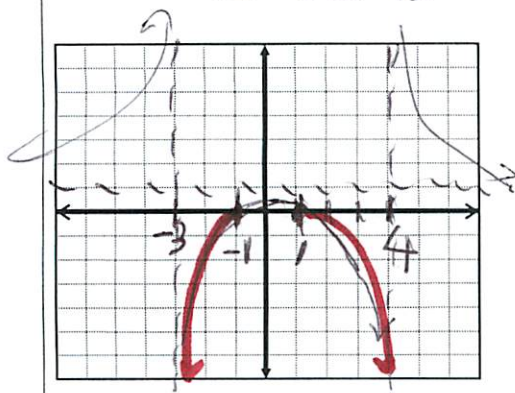
$-3(x-3)$

$$x = -3$$

20) $\frac{x^2-1}{x^2-x-12} < 0$

$\frac{(x-1)(x+1)}{(x-4)(x+3)} < 0$

sketch



Zero: $x=1, x=-1$

Think $(x-1)(x+1) = 0$

Undefined at: $x=4, x=-3$

Think $(x-4)(x+3) \neq 0$

Identify the intervals of x (aka, Solutions):

VA $\rightarrow -3 < x < -1$ $\leftarrow$ zero

and

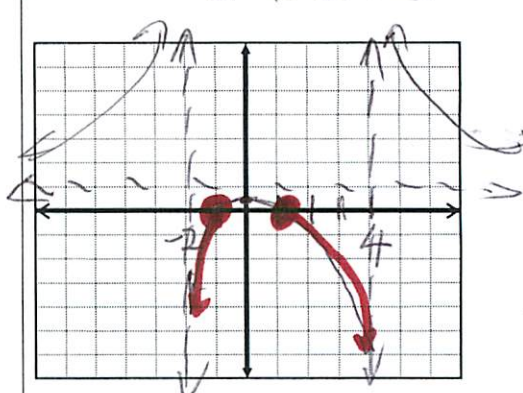
$1 < x < 4$ $\rightarrow$ VA

zero

21) $\frac{x^2-1}{x^2-2x-8} \leq 0$

$\frac{(x-1)(x+1)}{(x-4)(x+2)} \leq 0$

sketch



Zero: $x=1, x=-1$

Think $(x-1)(x+1) = 0$

Undefined at: $x=4, x=-2$

Think $(x-4)(x+2) \neq 0$

Identify the intervals of x (aka, Solutions):

VA $\rightarrow -2 < x \leq -1$ $\leftarrow$ zero

$1 \leq x < 4$ $\rightarrow$ VA

zero