

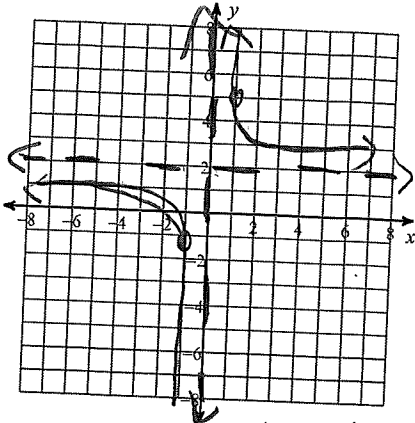
Unit 7 Review key

Rational Functions Review

Name _____ Date _____ Period _____

Graph each function. Identify the horizontal asymptote, vertical asymptote, x and y-intercepts and domain.

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



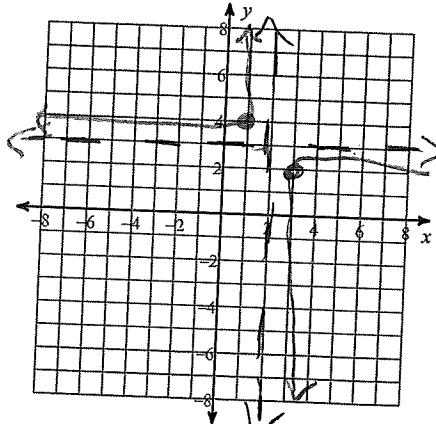
HA: $y \neq 2$ D: $\mathbb{R} \ x \neq 0$

VA: $x \neq 0$

X: $(-3/2, 0)$ $0 = \frac{3}{x} + 2 \rightarrow -2 = \frac{3}{x}$
 $-2x = 3 \quad x = -3/2$

Y: $(0,) \leftarrow$ NONE b/c VA

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



HA: $y \neq 3$

D: $\mathbb{R} \ x \neq 2$

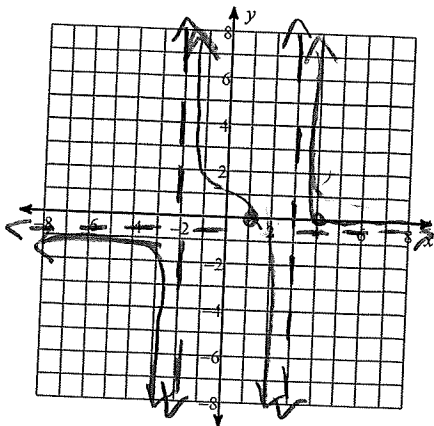
VA: $x \neq 2$

X: $(7/3, 0)$

Y: $(0, 3.5)$

Identify the holes, vertical asymptotes, x-intercepts, horizontal asymptote, and domain of each. Then sketch the graph.

3) $f(x) = \frac{x^2 - 5x + 4}{-4x^2 + 4x + 24} = \frac{(x-4)(x-1)}{-4(x-3)(x+2)}$



Holes: NONE

VA: $x \neq 3, -2$

HA: $y \neq -1/4$

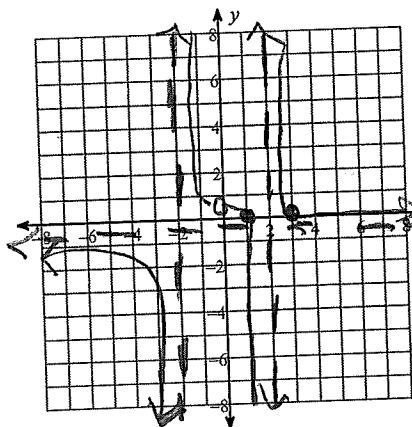
X int: $(4, 0), (1, 0)$

Y int: $(0, 16/7)$

D: $\mathbb{R} \ x \neq 3, -2$

X	Y
-6	-.48
-5	-.56
-1	.625
0	.166
1	0
4	0
5	-.07

$$4) f(x) = \frac{x^3 - 4x^2 + 3x}{-3x^3 + 12x} = \frac{x(x-3)(x-1)}{-3x(x+2)(x-2)} = \frac{(x-3)(x-1)}{-3(x+2)(x-2)}$$



X	Y
-6	-.65
-5	-.76
-4	-.97
-1	.88
1	-.08
5	-.12

Holes: (0, .25)

VA: $x \neq \pm 2$

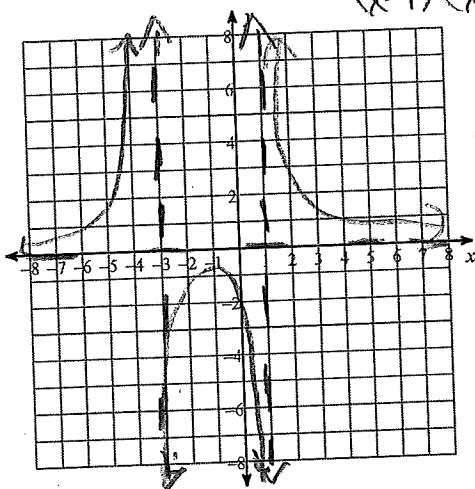
HA: $y \neq -1/3$

x int: (3, 0)(1, 0)

y int: NONE b/c hole

D: $\mathbb{R} x \neq \pm 2, 0$

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



X	Y
-8	-.088
-7	-.09
-6	-.095
-2	-.66
-1	-.75
0	-1.33
1	1.2
2	.48
3	.38
4	.38

Holes: NONE

VA: $x \neq 1, -3$

HA: $y \neq 0$

x int: NONE, b/c HA

y int: (0, -1.33)

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

Solve each equation. Remember to check for extraneous solutions.

$$6) \frac{1}{r^2-r} - \frac{8}{r} = \frac{2}{r^2-r} \quad r \neq 0, 1$$

$$\frac{1}{r(r-1)} - \frac{8}{r} = \frac{2}{r(r-1)}$$

$$\frac{1}{r(r-1)} - \frac{8(r-1)}{r(r-1)} = \frac{2}{r(r-1)}$$

Fancy one!

$$\frac{1-8(r-1)}{r(r-1)} = \frac{2}{r(r-1)}$$

$$1-8(r-1) = 2$$

$$1-8r+8 = 2$$

$$1-8r+8 = 2$$

$$-8r = -7$$

$$r = 7/8 \quad r \neq 0, 1$$

$$7) \frac{1}{a-5} - \frac{1}{a^2-a-20} = \frac{3}{a^2-a-20}$$

$$\frac{1}{a-5} - \frac{1}{(a+4)(a-5)} = \frac{3}{(a+4)(a-5)}$$

$$\frac{a+4-1}{(a-5)(a+4)} = \frac{3}{(a+4)(a-5)}$$

$$a+4-1 = 3$$

$$a+3 = 3$$

$$a = 0 \quad a \neq -4, 5$$

$a \neq -4$

Simplify each and state the excluded values.

$$n \neq 0, -\frac{10}{7}, 6$$

8) $\frac{1}{7x+1} \cdot \frac{63x+9}{x+9}$

$$x \neq -9, -\frac{1}{7}$$

$$\frac{1}{7x+1} \cdot \frac{9(7x+1)}{x+9} = \frac{9(7x+1)}{(7x+1)(x+9)}$$

$$\frac{9}{x+9} \quad x \neq -9, -\frac{1}{7}$$

9) $\frac{28n^3 + 40n^2}{4n^3 - 24n^2} \div \frac{7n+10}{9}$

$$\frac{4n^2(7n+10)}{4n^2(n-6)} \cdot \frac{9}{7n+10}$$

$$\frac{9}{n-6} \quad n \neq 0, -\frac{10}{7}, 6$$

10) $\frac{5x^2 - 34x + 24}{7x^2} \div \frac{5x-4}{7x^2}$

$$x \neq 0, \frac{4}{5}$$

$$\frac{(5x-4)(x-6)}{7x^2} \cdot \frac{7x^2}{5x-4}$$

$$x-6 \quad x \neq 0, \frac{4}{5}$$

11) $\frac{k+5}{56k+24} \cdot \frac{35k^2 - 6k - 9}{5k-3}$

$$k \neq -\frac{3}{7}, \frac{3}{5}$$

$$\frac{k+5}{8(7k+3)} \cdot \frac{(5k-3)(7k+3)}{(5k-3)}$$

$$\frac{k+5}{8} \quad k \neq -\frac{3}{7}, \frac{3}{5}$$

Simplify each expression. Identify domain restrictions.

12) $\frac{2m}{m+1} - \frac{2}{2m-3}$

$$m \neq -1, \frac{3}{2}$$

$$\frac{2m-3}{2m-3} \left(\frac{2m}{m+1} \right) - \left(\frac{2}{2m-3} \right) \left(\frac{m+1}{m+1} \right)$$

$$\frac{2m(2m-3) - 2(m+1)}{(2m-3)(m+1)} = \frac{4m^2 - 6m - 2m - 2}{(2m-3)(m+1)} = \frac{4m^2 - 8m - 2}{(2m-3)(m+1)}$$

14) $\frac{5}{2} + \frac{r+6}{10r^2 + 18r - 4} = \frac{5}{2} + \frac{r+6}{2(5r-1)(r+2)}$

$$\frac{5(5r-1)(r+2) + r+6}{2(5r-1)(r+2)} = \frac{25r^2 + 46r - 4}{2(5r-1)(r+2)}$$

$$x \neq \frac{1}{5}, -2$$

13) $\frac{6n}{4n-4} - \frac{5n}{n+1}$

$$\frac{6n}{4(n-1)} - \frac{5n}{n+1}$$

$$\frac{(n+1) \left(\frac{6n}{4(n-1)} \right) - \frac{5n}{n+1} \left(\frac{4(n-1)}{4(n-1)} \right)}{(n+1)(n-1)}$$

$$\frac{6n(n+1) - 5n(4(n-1))}{4(n+1)(n-1)}$$

$$\frac{6n^2 + 6n - 5n(4n-4)}{4(n+1)(n-1)} = \frac{6n^2 + 6n - 20n^2 + 20n}{4(n+1)(n-1)}$$

$$\frac{-14n^2 + 26n}{4(n+1)(n-1)}$$

$$m \neq 4, 1$$

15) $\frac{4}{2} + \frac{m-4}{9m^2 - 45m + 36}$

$$\frac{4}{2} \left(\frac{9(m-4)(m-1)}{9(m-4)(m-1)} \right) + \frac{m-4}{9(m-4)(m-1)} \left(\frac{2}{2} \right)$$

$$\frac{36(m-4)(m-1) + 2(m-4)}{18(m-4)(m-1) + 18(m-4)(m-1)}$$

$$\frac{36m^2 - 180m + 144 + 2m - 8}{18(m-4)(m-1)} = \frac{36m^2 - 180m + 144 + 2m - 8}{18(m-4)(m-1)}$$

$$\frac{36m - 17}{9(m-1)} \quad m \neq 4, 1$$

Find the inverse of each function.

$$16) f(x) = \frac{1}{x+2} + 2 \quad \frac{(x-2)(y+2)}{x-2} = 1$$

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

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

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

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

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

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

$$17) f(x) = \frac{4}{x-1} - 3$$

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

$$(y-1)(x+3) = \frac{4}{y-1} \cdot (y-1)$$

$$\frac{(y-1)(x+3)}{(x+3)} = \frac{4}{(x+3)}$$

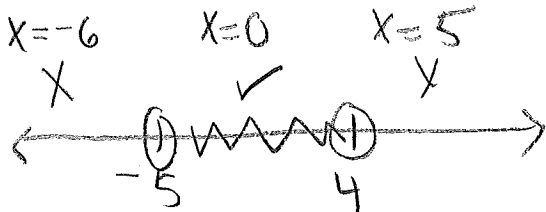
$$y-1 = \frac{4}{x+3} + 1$$

$$y = \frac{4}{x+3} + 1$$

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

Solve the inequality. State your answer in interval notation.

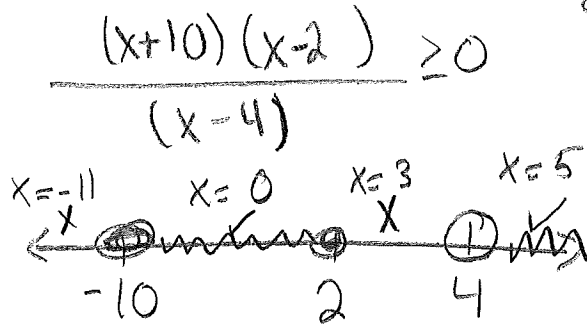
$$18) \frac{x+5}{x-4} < 0$$



$$(-5, 4)$$

$$19) \frac{x^2 + 8x - 20}{x-4} \geq 0$$

Use open circles for denominator



$$[-10, 2] \cup (4, +\infty)$$

$$20) \frac{2x+1}{x-5} \geq 1$$

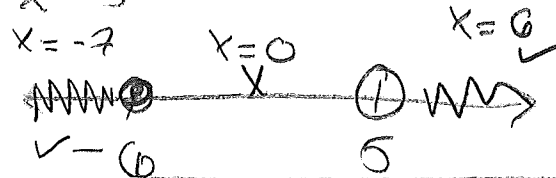
$$\frac{2x+1}{x-5} - 1 \geq 0$$

$$\frac{2x+1}{x-5} - \frac{(x-5)}{(x-5)} \geq 0$$

$$\frac{2x+1-(x-5)}{x-5} \geq 0$$

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

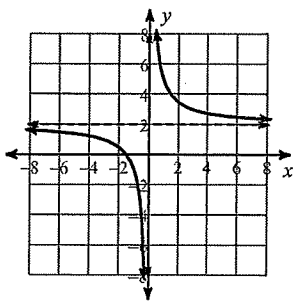
$$\frac{x+6}{x-5} \geq 0$$



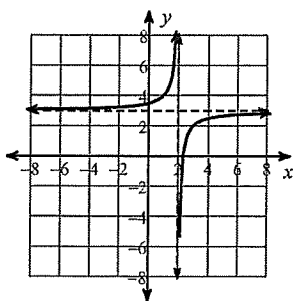
$$(-\infty, -6] \cup (5, +\infty)$$

Answers to Rational Functions Review

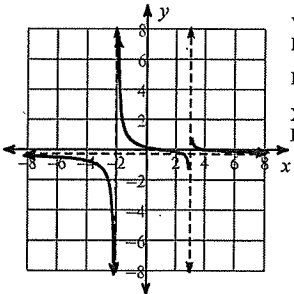
1)



2)

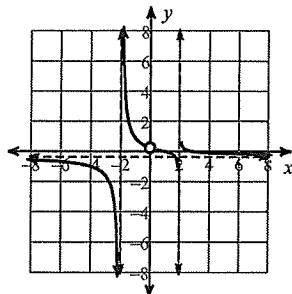


3)



Vertical Asym.: $x = 3, x = -2$
 Holes: None
 Horz. Asym.: $y = -\frac{1}{4}$
 X-intercepts: 4, 1
 Domain:
 All reals except $-2, 3$

4)



Vertical Asym.: $x = 2, x = -2$
 Holes: $x = 0$
 Horz. Asym.: $y = -\frac{1}{3}$
 X-intercepts: 3, 1
 Domain:
 All reals except $-2, 0, 2$

5)

6) $\left\{\frac{7}{8}\right\}$

7) $\{0\}$

8) $\frac{9}{x+9}; \left\{-\frac{1}{7}, -9\right\}$

9) $\frac{9}{n-6}; \left\{0, 6, -\frac{10}{7}\right\}$

10) $x-6; \left\{0, \frac{4}{5}\right\}$

11) $\frac{k+5}{8}; \left\{-\frac{3}{7}, \frac{3}{5}\right\}$

12) $\frac{4m^2 - 8m - 2}{(2m-3)(m+1)}$

13) $\frac{-7n^2 + 13n}{2(n-1)(n+1)}$

14) $\frac{25r^2 + 46r - 4}{2(5r-1)(r+2)}$

15) $\frac{18m-17}{9(m-1)}$

16)

17)

18)

19)

20)

