


Math 30-1 Chapter 9 Review
Rational Functions

Name _____



Date reviewed with teacher:

Signature of teacher:



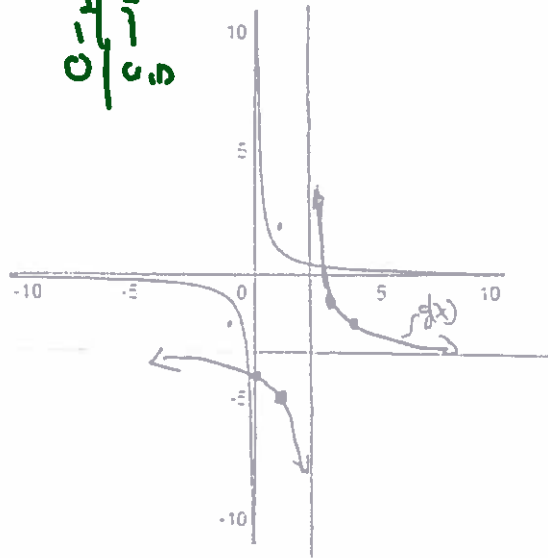
Math 30-1: Chapter 9 Review Assignment Rational Functions

Answer the following questions. Remember to show all your work.

1. The graph of $f(x) = \frac{1}{x}$ is shown at right.

x	y
2	1/2
0	undefined

(RF14.1)



a) Given that $g(x) = \frac{2}{x-2} - 3$, describe the transformations that would need to be applied to the graph of $y = f(x)$ to obtain the graph of $y = g(x)$.

21 ✓
 ✓ k.s. by factor 2
 ✓ Right 2 Down 3

b) Using the transformations you listed in part a), sketch the graph of $y = g(x)$. No Calc

c) State the following characteristics of the graph of $y = g(x)$.

TV ✓

• domain: $\{x | x \neq 2, x \in \mathbb{R}\}$

• range: $\{y | y \neq -3, y \in \mathbb{R}\}$

TV ✓ • equation of horizontal asymptote: $y = -3$

TV ✓ • equation of vertical asymptote: $x = 2$

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

$$\begin{aligned}
 g(x) &= \frac{2}{x-2} - \frac{3(x-2)}{(x-2)} \\
 &= \frac{2 - 3x + 6}{x-2} \\
 &= \frac{-3x + 8}{x-2}
 \end{aligned}$$

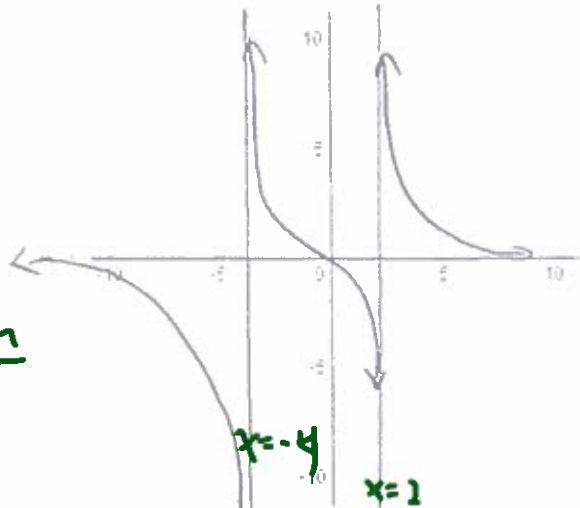
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2. Sketch the graph of the following functions and determine the following characteristics for each function below: domain, x- and y-intercepts, equation(s) of vertical asymptote(s). (RF14.1)

a) $y = \frac{3x}{x^2 + 2x - 8}$

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



Form

domain:

$\{x \mid x \neq -4, 2, x \in \mathbb{R}\}$

x-intercept(s):

$y = 0$
 $x = 0$

y-intercept(s):

$x = 0$
 $y = \frac{0}{-8} = 0$

equation of vertical asymptotes:

$x = -4 \quad x = 2$

H.A. $y = 0$

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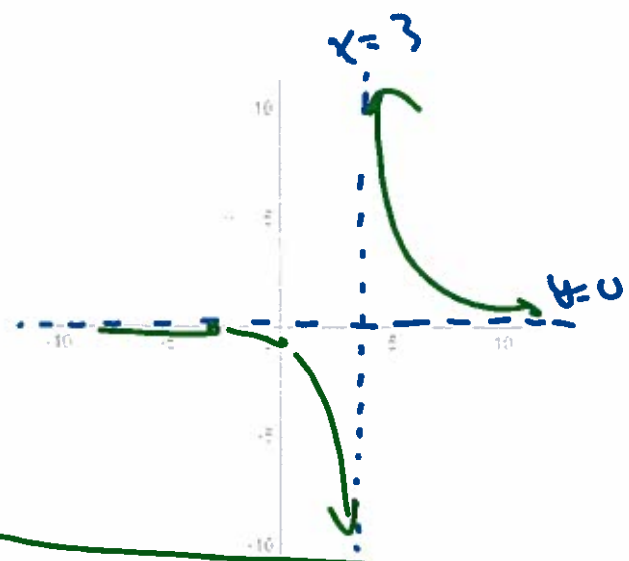
b) $y = \frac{x+3}{x^2-9}$ $\frac{x+3}{(x-3)(x+3)}$

domain: $\{x \mid x \neq \pm 3, x \in \mathbb{R}\}$

x-intercept(s): ~~$y=0$~~
 ~~$x=3$~~
 None

y-intercept(s): $x=0$
 $y = -\frac{1}{3}$

equation of vertical asymptotes:
 $x = 3$



4

<u>H.o.A.</u>	<u>P.O.D.</u>
$y=0$	$(-3, -\frac{1}{6})$
<u>C.</u>	

3. Write the equation $y = \frac{5x-11}{x-3}$ in the form $y = \frac{a}{x-h} + k$. State the equations of the asymptotes. (RF14.1)

V.A. $x=3$ H.o.A. $y=5$

Cool But No Need to learn this

$$y = \frac{5x-11}{x-3}$$

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

$\lim_{x \rightarrow \infty} y = 0 + 5 = 5$

$\frac{4}{x-3} + 5$
 Same Graph

2

4. Given that $y = \frac{3x+7}{2x+5}$,

(RF14.1)

a) Determine the equation of the asymptotes, the domain, and the range.

TS
W

V.A. $x = -\frac{5}{2}$
H.A. $y = \frac{3}{2}$

$D \{x \mid x \neq -\frac{5}{2}, x \in \mathbb{R}\}$
 $R \{y \mid y \neq \frac{3}{2}, y \in \mathbb{R}\}$

$\lim_{x \rightarrow \pm\infty} y = ?$

b) What is a shortcut for finding the equation of the horizontal asymptote?

☺ if deg of $n(x) = \text{deg. of } d(x)$ for $R(x) = \frac{n(x)}{d(x)}$
then coefficients of highest deg terms give us the H.A.

c) Create a rational equation that has a horizontal asymptote of $\frac{5}{7}$.

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

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5. Algebraically determine the coordinates of the point of discontinuity on the graph of

$$f(x) = \frac{2x^2 - 15x + 7}{x - 7}$$

(RF14.3)

$$f(x) = \frac{(2x - 1)(x - 7)}{(x - 7)} \quad x \neq 7$$

3 P.O.D when $x=7$
and $y = 2(7) - 1 = 13$
 $(7, 13)$

6. Determine if the following functions have points of discontinuity, vertical asymptotes, or both. State the coordinates of the points of discontinuity and/or the equations of the vertical asymptotes, if applicable.

(RF14.3)

a) $f(x) = \frac{x^2 - 2x - 8}{x + 2}$

$$f(x) = \frac{(x - 4)(x + 2)}{x + 2}$$

P.O.D. $(-2, -6)$ No V.A.
Cancel factor No discontinuity

b) $g(x) = \frac{x^2 - 4x - 5}{x + 5}$

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

No P.O.D. V.A. of $x = -5$
No cancel factor factor left

c) $h(x) = \frac{x^2 - 2x - 15}{x^2 - 7x + 10}$

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

P.O.D. $(5, \frac{8}{3})$ V.A. of $x = 2$

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No N.P.V.
2

7. Create a rational function that has neither a vertical asymptote nor a point of discontinuity.

(RF14.3)

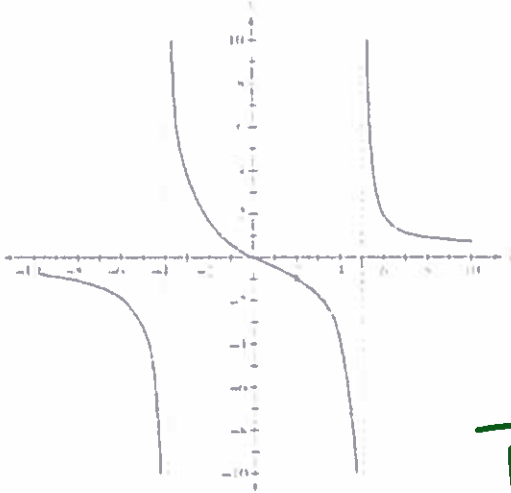
Basic
 $R(x) = \frac{3x+2}{5}$

$R(x) = \frac{5x^3 + 3x^2}{x^2 + 2}$

infinite possibilities

8. The graph of the function below can be expressed in the form $y = \frac{ax}{x^2 + bx + c}$.

(RF14.2)



$y = \frac{ax}{(x+4)(x-5)}$

given point (2, -1)

Can not be hole

2 sub in point

$-1 = \frac{a(2)}{(2+4)(2-5)}$

$+18 = 2a$

$+9 = a$

3

Determine the values of a, b, and c.

$y = \frac{+9x}{x^2 - 1x + 20}$

2 $a = +9$ $b = -1$ $c = 20$

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9. Without using technology, match each equation with its graph. Explain your reasoning.

(RF14.5)

Up 2

a) $y = \frac{3}{x} + 2$



Reflected in x axis up 2

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

No Stretches

2

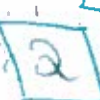
test 2

c) $y = \frac{3}{x+2}$



fold in x axis and test 2

d) $y = \frac{3}{x+2}$

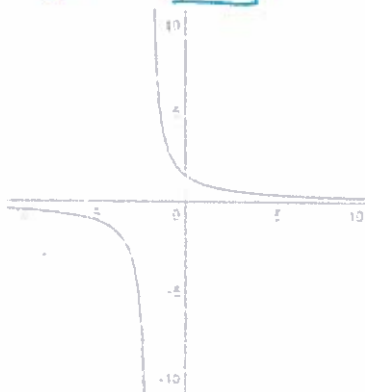


Mother's $f(x) = \frac{3}{x}$

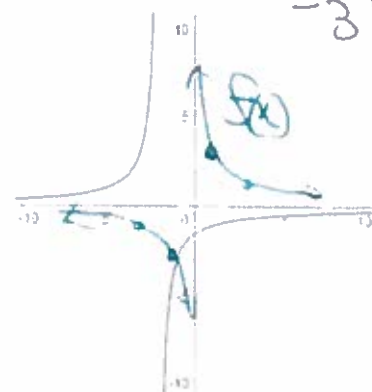
all transformations of

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

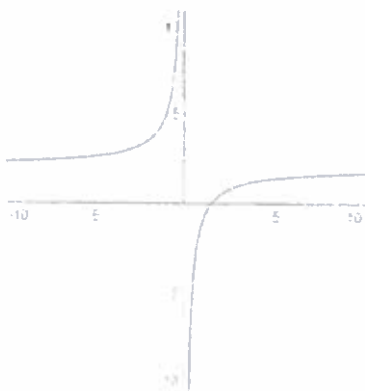
x	y
3	1
1	3
-1	-3
-3	-1



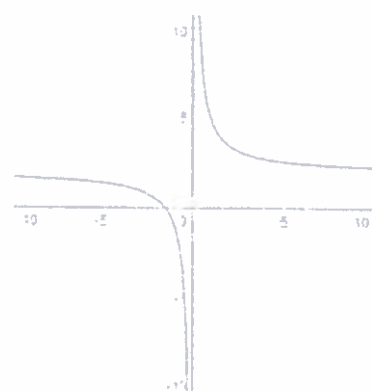
Graph 1



Graph 2



Graph 3



Graph 4

(RF14.6, 14.7)

10. Given that $\frac{7}{x} = 1 + \frac{x-7}{5}$ $x \neq 0$

a) Solve the equation algebraically.

35
3

$$(5x) \frac{7}{x} = 1 + \frac{(5x)(x-7)}{5}$$

$$35 = 5x + x^2 - 7x$$

$$0 = x^2 - 2x - 35$$

$$(x-7)(x+5) = 0$$

$$\underline{x=7} \quad \underline{x=-5}$$

b) Solve the equation graphically using a system of two functions. Sketch your window and state your window settings.



I graphed $y = \frac{7}{x} - 1 - \frac{(x-7)}{5}$ in the S.W.

The solutions are the xints of the graph so $x=7$ and $x=-5$

c) Solve the equation graphically using a single function. Sketch your window and state your window settings.



I graphed $y_1 = \frac{7}{x}$ and $y_2 = 1 + \frac{x-7}{5}$ in the S.W.

The solutions are the x values of the points of intersection $x=7, -5$

d) Explain how the x-intercepts of the graph in part c) relate to the roots of the equation.

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The xints are where $y=0$ therefore the xints are the roots of the equation

(RF14.7)

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11. Given that $\frac{3x}{x+2} = x - \frac{6}{x+2}$

a) Solve the equation algebraically.

$\checkmark \frac{(x+2)3x}{x+2} = x - \frac{(x+2)6}{x+2}$ $x \neq -2$

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$\checkmark 3x = x^2 + 2x - 6$

$0 = x^2 - x - 6$

$0 = (x-3)(x+2)$

$\checkmark x = 3, \cancel{-2}$

b) Verify your solution.

$x = 3$

$x = -2$ U.D.

$\checkmark \frac{9}{5} \mid \begin{array}{r} 3 - \frac{6}{5} \\ \frac{15}{5} - \frac{6}{5} \end{array}$

$\frac{-6}{5} \mid \frac{0}{5}$

1

$\frac{9}{5}$

L.S. = R.S.

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