Acc. Geom/Algebra II Name ANSWERS .

Transformations of Rationals and others Period ________Date ____________

I. As we've learned earlier, $y = x^2$ can be transformed into $f(x) = a \cdot (x - h)^2 + k$.

1. What effect does **a** have on the graph of $y = x^2$?
   Vertically stretches (or compresses if abs(a) < 1) the entire graph by a factor of a.
2. What effect does **h** have on the graph of $y = x^2$?
   Shifts the entire graph h units to the left (if positive) or right (if negative).
3. What effect does **k** have on the graph of $y = x^2$?
   Shifts the entire graph k units up (if positive) or down (if negative).

II. You also know what $y = x^3$ looks like now. So consider the graph $g(x) = a \cdot (x - h)^3 + k$.

1. What effect does **a** have on the graph of $y = x^3$?
   Vertically stretches (or compresses if abs(a) < 1) the entire graph by a factor of a.
2. What effect does **h** have on the graph of $y = x^3$?
   Shifts the entire graph h units to the left (if positive) or right (if negative).
3. What effect does **k** have on the graph of $y = x^3$?
   Shifts the entire graph k units up (if positive) or down (if negative).

III. The parent graph of a rational function is $y = \frac{1}{x}$. So consider $h(x) = k + \frac{a}{x - h}$.

1. What effect does **a** have on the graph of $y = \frac{1}{x}$?

   Vertically stretches (or compresses if abs(a) < 1) the entire graph by a factor of a.

2. What effect does **h** have on the graph of $y = \frac{1}{x}$?

   Shifts the entire graph h units to the left (if positive) or right (if negative).

3. What effect does **k** have on the graph of $y = \frac{1}{x}$?

   Shifts the entire graph k units up (if positive) or down (if negative).

IV. Look at all the cases above, and then describe the locations of the variables in relation to the parent graph.

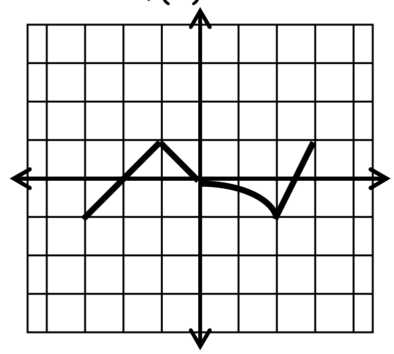
1. Where is **a** located? ***It's the coefficient in front of the function.***

   What does **a** do?
   Vertically stretches (or compresses if abs(a) < 1) the entire graph by a factor of a.
   What happens when $a < 0$? ***It reflects the graph over the x-axis.***

2. Where is **h** located?
   Added or subtracted directly to x.
   What does **h** do?
   Shifts the entire graph h units to the left (if positive) or right (if negative).

3. Where is **k** located?
   Added or subtracted to the function.
   What does **k** do?
   Shifts the entire graph k units up (if positive) or down (if negative).

V. Consider the sketch of f(x) to the right. Answer questions about f(x) and sketch each of the following transformations of f(x).



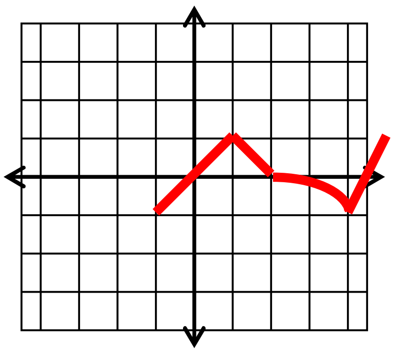
1. f(1) = 0.25

2. f(2) = -1

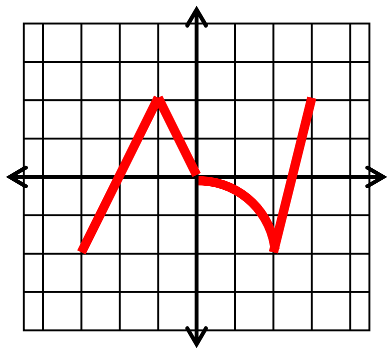
3. f(0) = 0

4. f(–1) = 1

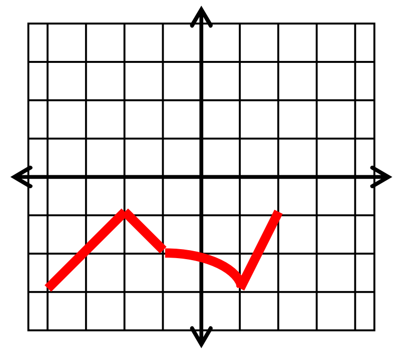
5. Sketch f(x – 2)



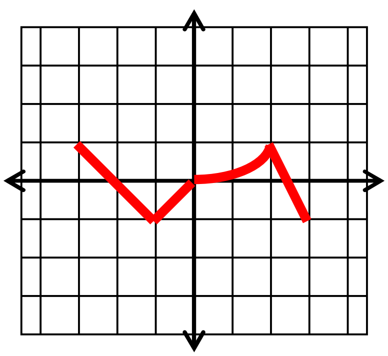
6. Sketch 2f(x)



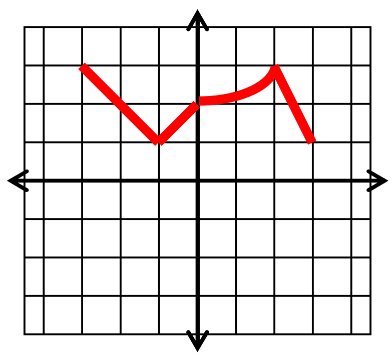
7. Sketch f(x + 1) – 2



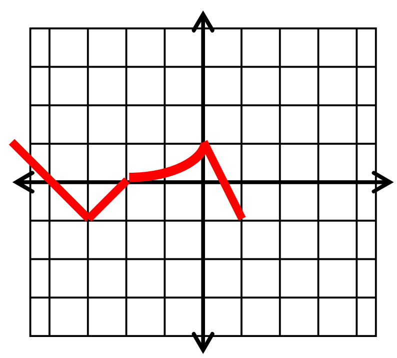
8. Sketch -f(x)



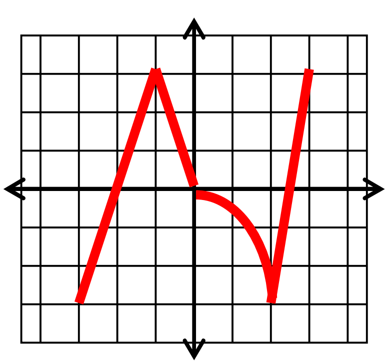
9. Sketch -f(x) + 2



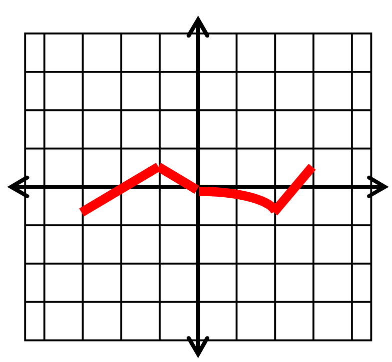
10. Sketch -f(x + 2)



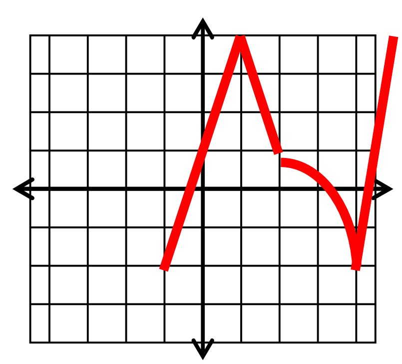
11. Sketch 3f(x)



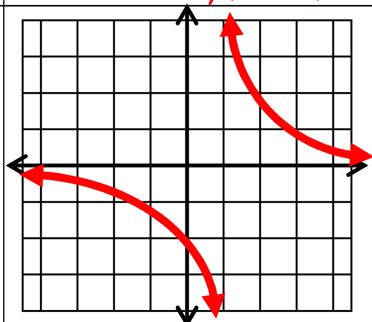
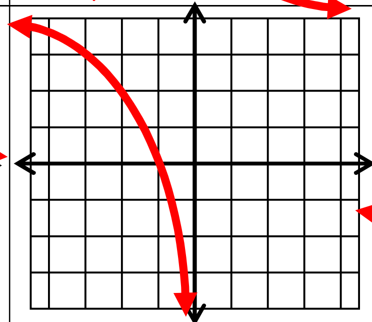
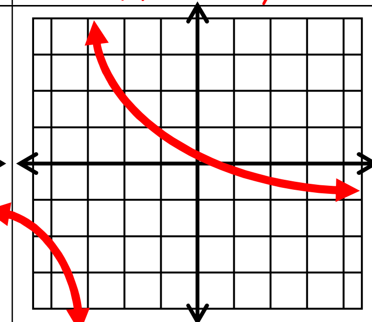
12. Sketch ($\frac{1}{2}$)f(x)



13. Sketch 1 + 3f(x – 2)



VI. For each of the following: a) **Evaluate** f(2), b) Describe the **transformations** of $y = 1/x$ that have been done to this function, c) Use this information to **sketch** the graph, d) Find the **domain** of the function, e) Find the **range** of the function, and f) Write **equations** of all the **asymptotes**.

Problem:	$f(x) = \frac{2}{x-1}$	$g(x) = \frac{-3}{x} + 4$	$h(x) = \frac{1}{2(x+3)} - 1$
Evaluate at $x = 2$	f(2) = ***2***	g(2) = ***5/2***	h(2) = ***-9/10***
Transformations	*Shift 1 unit to the right; Vertical stretch by factor of 2.*	*Shift 4 units up; Reflect over x-axis; Vertical stretch by 3.*	*Shift 1 unit down; Shift 3 unitd to the left; Stretch by 1/2.*
Sketch the graph			
Domain	***x ≠ 1***	***x ≠ 0***	***x ≠ -3***
Range	***y ≠ 0***	***y ≠ 4***	***y ≠ -1***
Asymptotes	***x = 1 and y = 0***	***x = 0 and y = 4***	***x = -2 and y = -1***

VII. For each of the following: a) **Evaluate** f(-3), b) **Divide** this rational function to write its **quotient** in transformation form, c) Describe the **transformations** of $y = 1/x$ that have been done to this function, d) Use this information to **sketch** the graph, e) Find the **domain** of the function, f) Find the **range** of the function, and g) Write **equations** of all the **asymptotes**.

Problem:	$f(x) = \frac{x-2}{x+1}$	$g(x) = \frac{3x+5}{x-2}$	$h(x) = \frac{x-4}{2x-5}$
Evaluate $x = -3$	f(-3) = 2.5	g(-3) = .8	h(-3) = 7/11
Quotient	f(x) = $1 - \frac{3}{x+1}$ or $-\frac{3}{x+1} + 1$	g(x) = $\frac{11}{x-2} + 3$	h(x) = $-\frac{3/2}{2x-5} + \frac{1}{2} = -\frac{3}{2(2x-5)} + \frac{1}{2}$
Transformations	Left 1, up 1, Reflects across the x axis	Right 2, up 3	Right 5/2, up ½, reflect across x axis
Sketch the graph	(Graph in graphing calculator. Notice the location of the horizontal and vertical asymptotes and compare these to the transformations)	→	→
Domain	***x ≠ -1***	***x ≠ 2***	***x ≠ 2.5***
Range	***y ≠ 1***	***y ≠ 3***	***y ≠ .5***
Asymptotes	***x = -1 and y = 1***	***x = 2 and y = 3***	***x = 2.5 and y = .5***

VIII. REVIEW of what I've already mastered: Perform the indicated operations, and **simplify completely**.

A) $\dfrac{x+3}{x-7} \bullet \dfrac{x^2-6x-7}{x^2-9}$

$\dfrac{x+1}{x-3}$

B) $\dfrac{25x^2-100}{x^2-x-12} \div \dfrac{x^2-2x-24}{2x^2-72}$

$\dfrac{50(x+2)(x-2)(x+6)}{(x-4)(x+4)(x+3)}$ or $\dfrac{50x^3+300x^2-200x-1200}{(x-4)(x+4)(x+3)}$

C) $\dfrac{\dfrac{1}{x+2}}{1+\dfrac{1}{x+2}}$

$\dfrac{1}{x+3}$

D) $\dfrac{12+\dfrac{1}{x}-\dfrac{1}{x^2}}{4+\dfrac{1}{x}}$

$\dfrac{(4x-1)(3x+1)}{x(4x+1)}$ or $\dfrac{12x^2+x-1}{4x^2+x}$

E) $\dfrac{x}{x^2-x-12} + \dfrac{x-2}{x^2-16}$

$\dfrac{2x^2+5x-6}{(x+4)(x-4)(x+3)}$

F) $\dfrac{4}{x+6} - \dfrac{x+3}{x^2-36}$

$\dfrac{3(x-9)}{x^2+x-2}$

G) $\dfrac{x+a}{x-a} - \dfrac{x^2-a^2}{ax-a^2}$

$\dfrac{ax+2a^2-x^2}{a(x-a)}$

H) $\dfrac{3x+13}{x^2-3x-10} - \dfrac{16}{x^2-6x+5}$

$\dfrac{3(x+9)}{x^2+x-2}$