Transforming Functions Worksheet

Summary of Transformations

| Transformation	Appearance in Function	Transformation of Point
Vertical Translation	$f(x) \to f(x) + d$	$(x,y) \to (x,y+d)$
Horizontal Translation	$f(x) \to f(x - c)$	$(x,y) \to (x+c, y)$
Vertical Stretch/Compression	$f(x) \to af(x)$	$(x,y) \to (x, ay)$
Reflection in x-axis	$f(x) \to -f(x)$	$(x,y) \to (x,-y)$
Horizontal Stretch/Compression	$f(x) \to f(kx)$	$(x,y) \to \left(\dfrac{x}{k}, y\right)$
Reflection in y-axis	$f(x) \to f(-x)$	$(x,y) \to (-x,y)$

Order of Transformations
1. Stretches/Compressions and Reflections
2. Translations

1. Given the graph of f(x), sketch the graph of the following functions, and state the domain and range for each:
   a. $2f(x - 5)$

   b. $-f(2x) + 3$

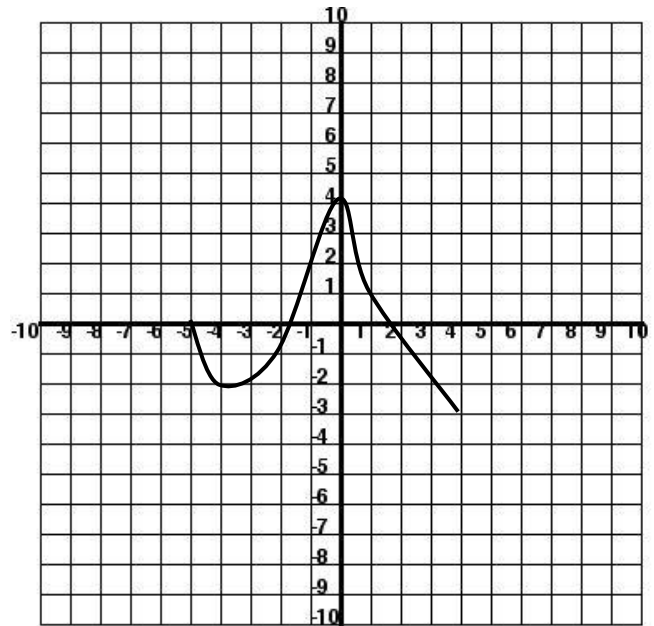   c. $\frac{1}{2}f(-x + 4) - 2$
   (Remember to factor first!)
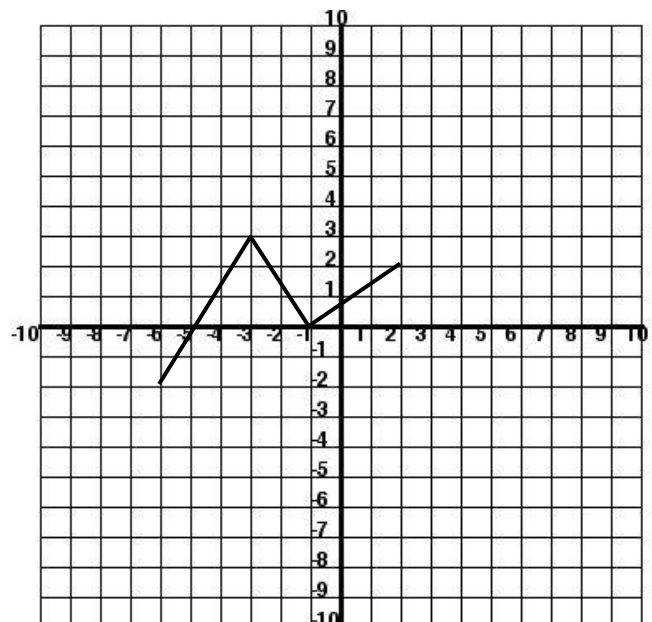
2. Given the graph of f(x), sketch the graph of the following functions, and state the domain and range for each:

    a. $2f(2x - 4) + 1$
    (Remember to factor first!)

    b. $-f(-x + 3)$
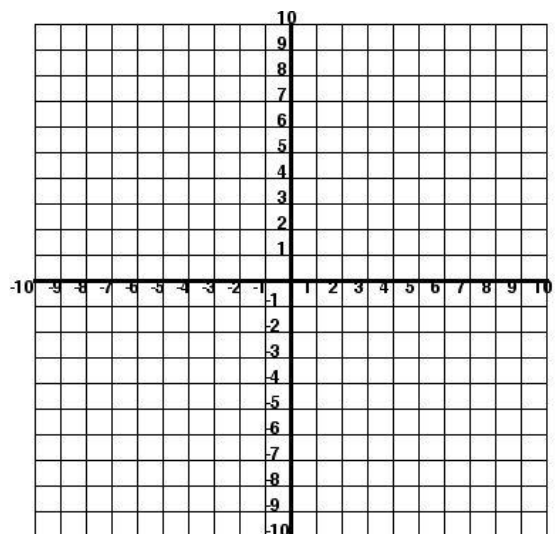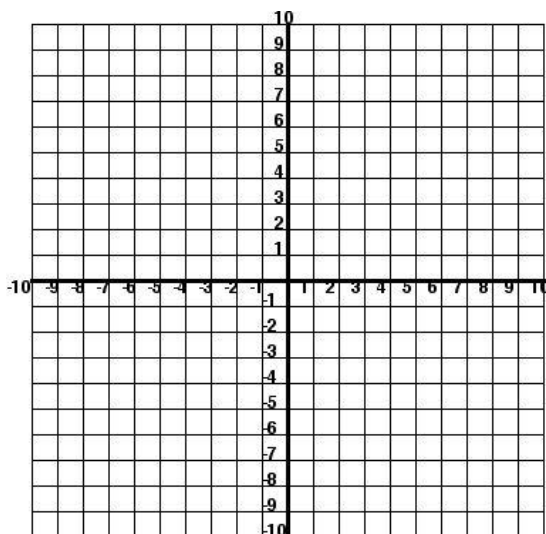   (Remember to factor first!)

    c. $f(-2x) - 5$

3. For each function below:

    i. Describe the transformations that have been applied to obtain the function from the given "base function".

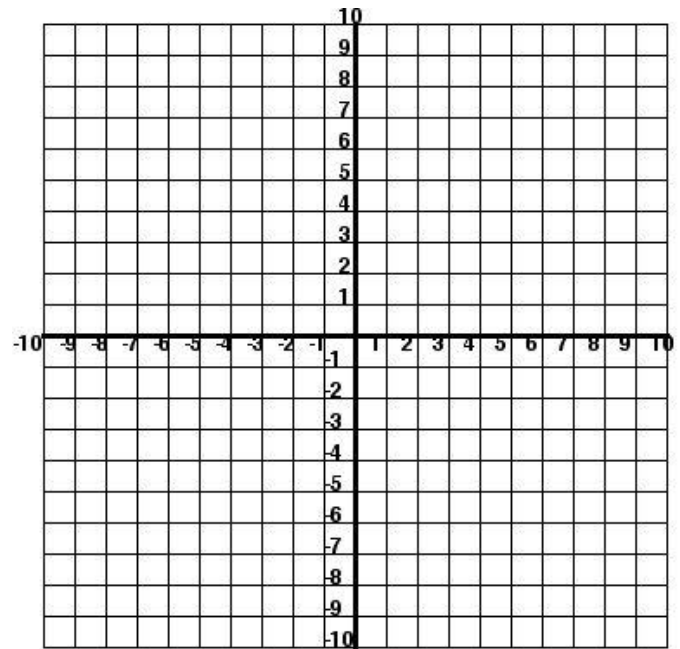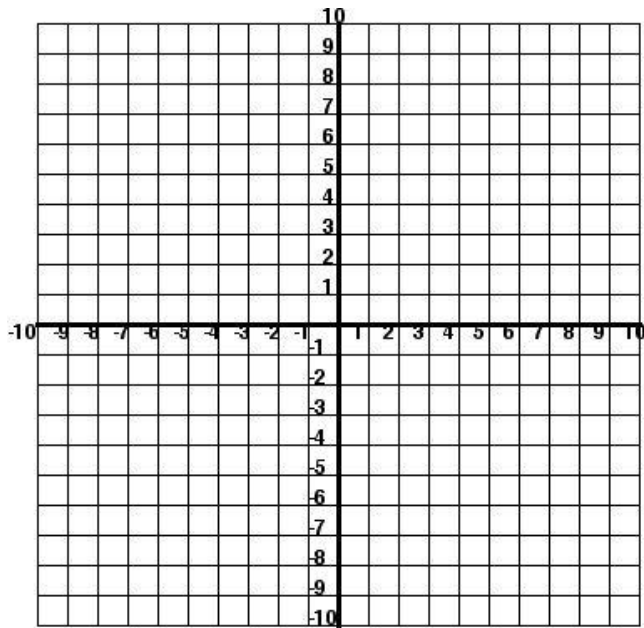   ii. Use your knowledge of the graph of the base function, and the transformations, to graph the function.

    a. $y = -2(x + 3)^2 + 5, \quad y = x^2$ b. $y = 3\sqrt{-x} - 5, \quad y = \sqrt{x}$

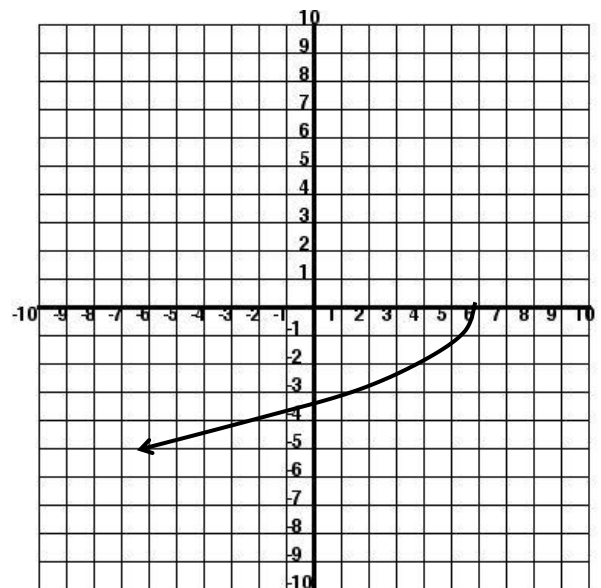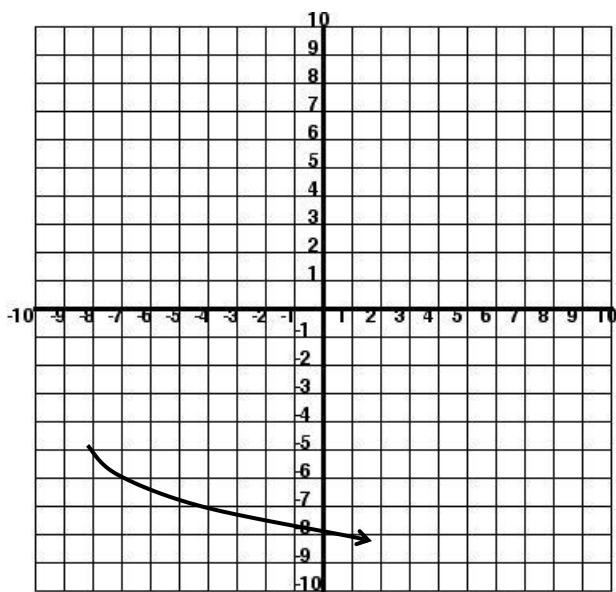c. $y = \dfrac{1}{x+1} - 7, \quad y = \dfrac{1}{x}$

d. $y = -\sqrt{-\frac{1}{2}x + 2} + 4, \quad y = \sqrt{x}$
(Remember to factor first!)

4. Write the equation of the following functions, given the graph.

a.

b.

5. Write the equation of the following functions, given the original function and the transformations performed.

  a. $f(x) = \dfrac{1}{x}$, vertically stretched by a factor of 7, reflected in the y-axis, translated 5 units to the right and translated 3 units downwards.

  b. $f(x) = x$, horizontally compressed by a factor $\dfrac{1}{3}$, reflected in both the x-axis and the y-axis, translated 11 units to the left and 4 units up.

  c. $f(x) = \sqrt{x}$, vertically stretched by a factor of 2, horizontally stretched by a factor of 5 and translated 21 units to the right.

6. State the Domain and Range for both the original function and the transformed function for each part of question 5.

	Original Domain	Original Range	Transformed Domain	Transformed Range
5a				
5b				
5c				

Round 5

Suppose $(6,1)$ is the point of the graph of $y = f(x)$. For each of the following, name a point on the graph then name the transformation.

1. $y = f(3x)$ _____ _____

2. $y = f(x+2)$ _____ _____

3. $y = f(x)+5$ _____ _____

4. $y = \dfrac{1}{2}f(x)$ _____ _____

5. $y = f(-x)$ _____ _____

6. $y = f(x-7)$ _____ _____

7. $y = 4f(x)$ _____ _____

8. $y = f\left(\dfrac{1}{2}x\right)$ _____ _____

9. $y = -f(x)$ _____ _____