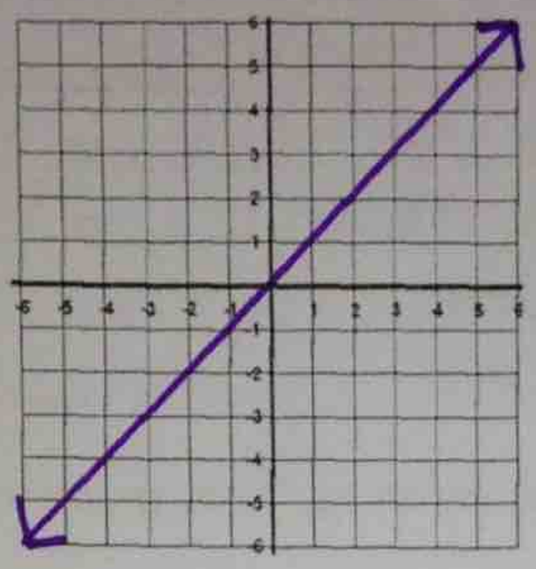
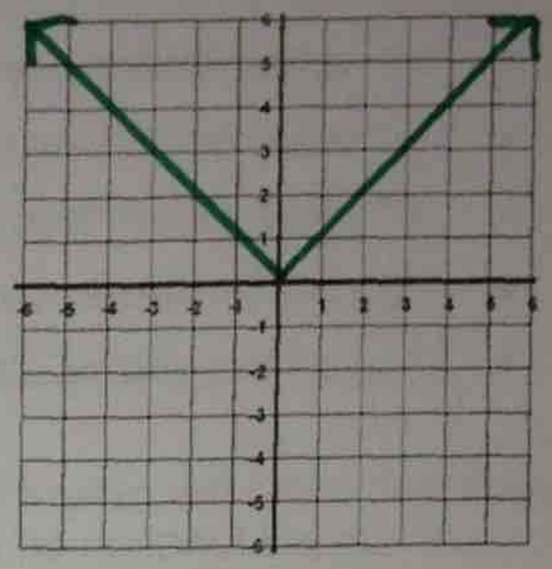
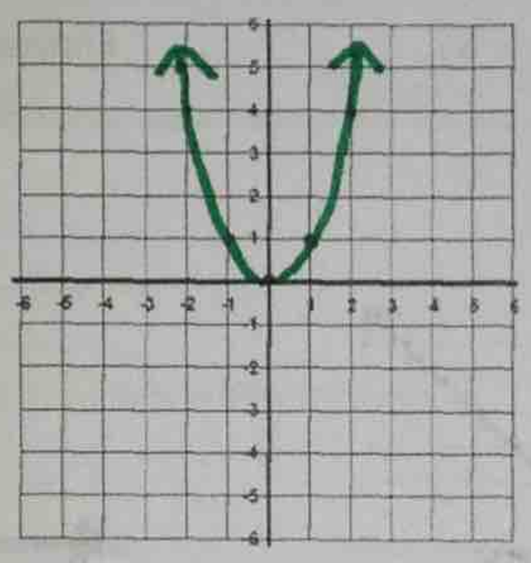
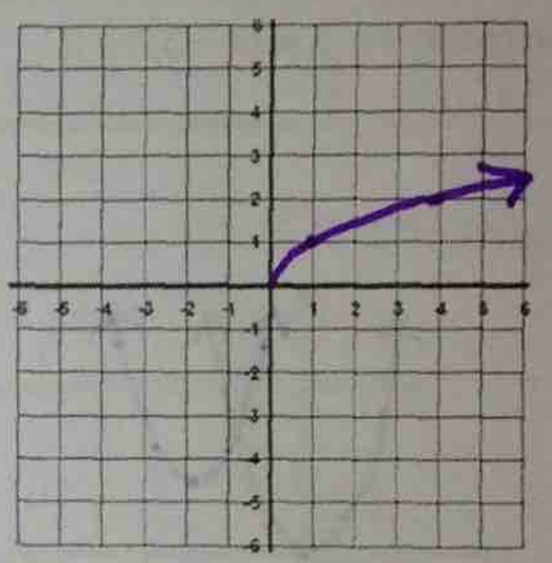
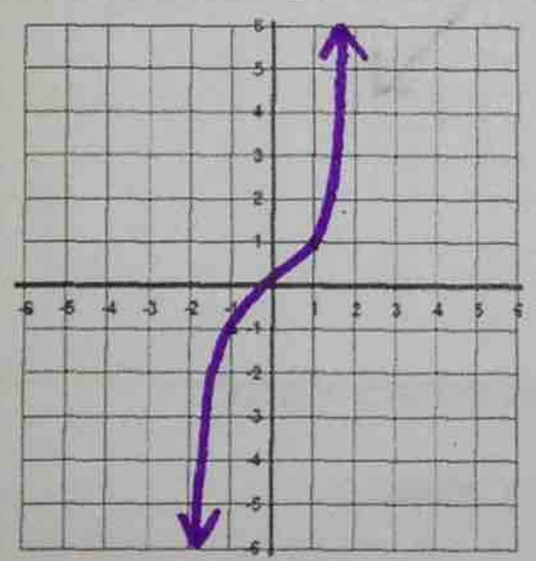
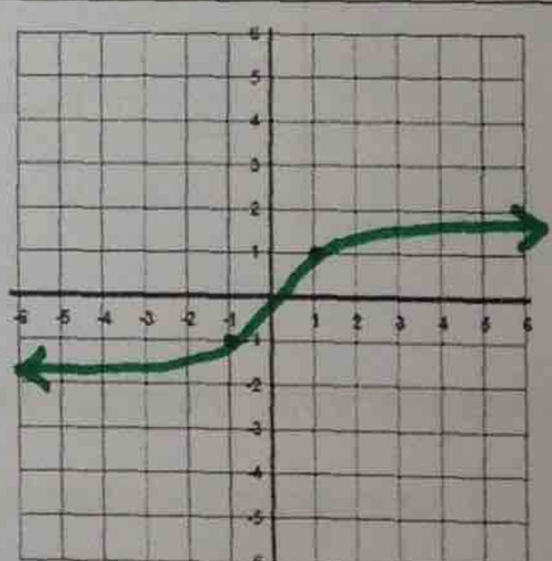
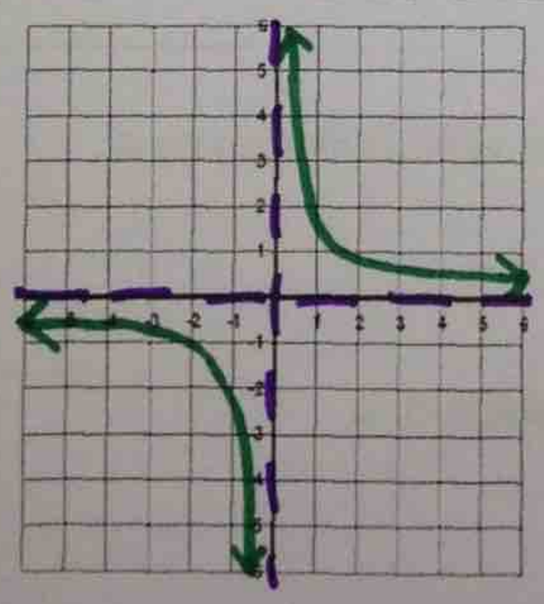
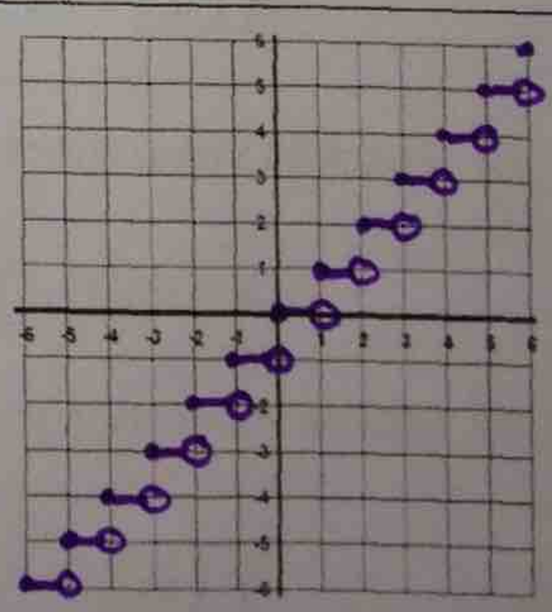
Math 3

2.2 Parent Functions and Transformations

Unit 2

Parent Functions: The simplest function of a family of functions

Parent Function	Graph	Parent Function	Graph
Linear Function $f(x) = x$ D: $(-\infty, \infty)$ R: $(-\infty, \infty)$		Absolute Value Function $f(x) = \lvert x \rvert$ D: $(-\infty, \infty)$ R: $[0, \infty)$	
Quadratic Function $f(x) = x^2$ D: $(-\infty, \infty)$ R: $[0, \infty)$		Square Root Function $f(x) = \sqrt{x}$ D: $[0, \infty)$ R: $[0, \infty)$	
Cubic Function $f(x) = x^3$ D: $(-\infty, \infty)$ R: $(-\infty, \infty)$		Cube Root Function $f(x) = \sqrt[3]{x}$ D: $(-\infty, \infty)$ R: $(-\infty, \infty)$	
Reciprocal Function $f(x) = \frac{1}{x}$ D: $(-\infty, 0) \cup (0, \infty)$ R: $(-\infty, 0) \cup (0, \infty)$		Greatest Integer Function $f(x) = [x]$	

Transformations: How a graph has been moved or the shape has been manipulated

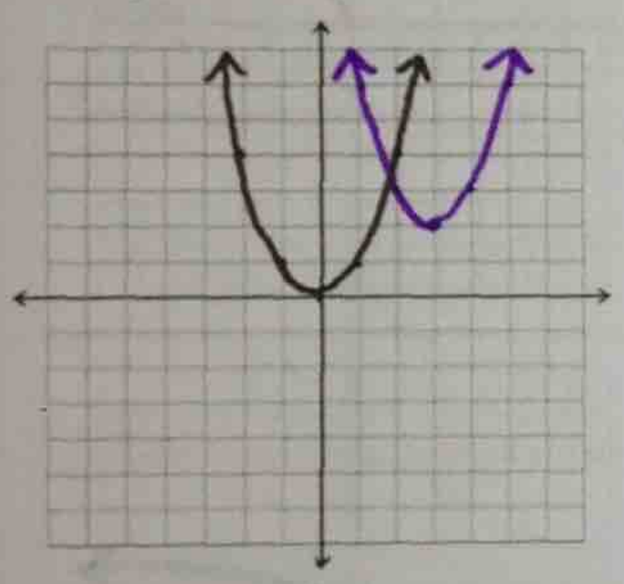
$$y = af(x-h)+k$$

- "a" value determines whether the graph has vertically stretched or compressed.
- "h" value determines whether the graph has shifted left (+) or right (-).
- "k" value determines whether the graph has shifted up (+) or down (-).
- -f(x) demonstrates a reflection across the x axis.
- f(-x) demonstrates a reflection across the y axis.

Directions: State the parent function and the types of transformations. Then, graph the parent function and the transformed function on the graph below.

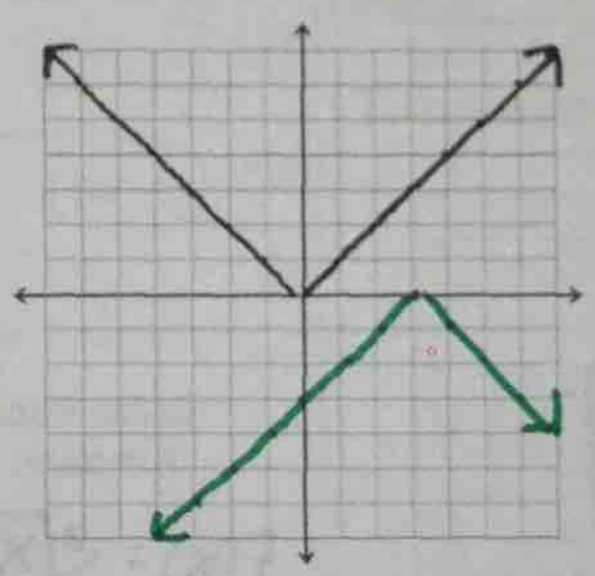
Example 1: $y = (x-3)^2 + 2$

right 3
up 2
vertex (3,2)



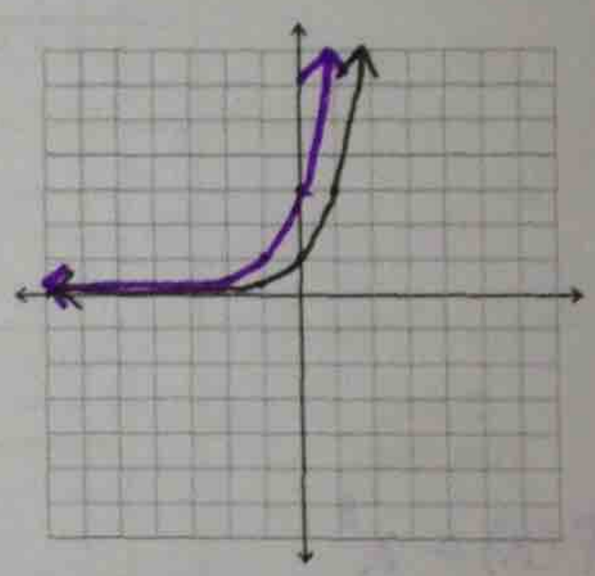
Example 2: $y = -|x-3|$

reflection over x-axis
right 3
vertex: (3,0)



Example 3: $y = 3^{x+1}$

Left 1



Directions: Write the equation of the function with the given transformations.

a) Quadratic Function; reflection across the x-axis, left 3, down 2

$f(x) = -(x+3)^2 - 2$

b) Absolute Value Function; reflection across the y-axis, vertical stretch by 8

$f(x) = 8|-x|$

c) Square Roof Function; right 7, up 9, vertical compression of ½

$f(x) = \frac{1}{2}\sqrt{x-7} + 9$