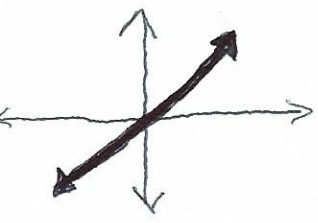
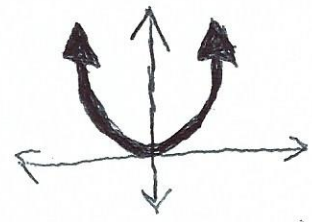


Graphs of Parent functions

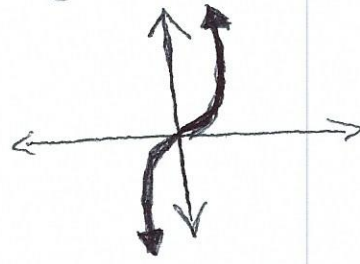
$f(x) = x$   
Linear



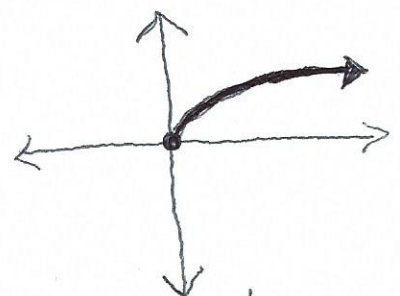
$f(x) = x^2$   
Quadratic



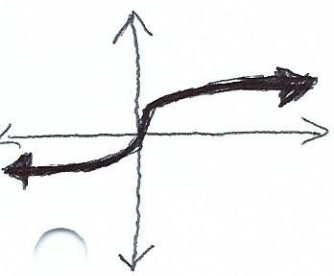
$f(x) = x^3$   
Cubic



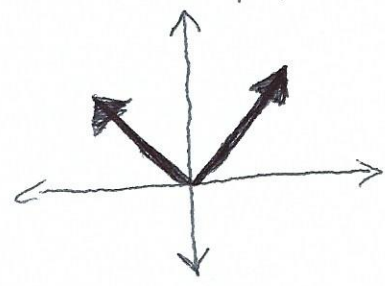
$f(x) = \sqrt{x}$   
Sq. root



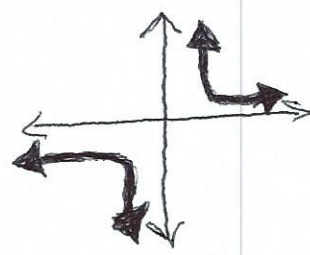
$f(x) = \sqrt[3]{x}$   
Cube Root



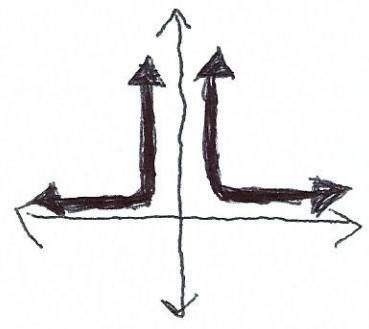
absolute value  
 $f(x) = |x|$



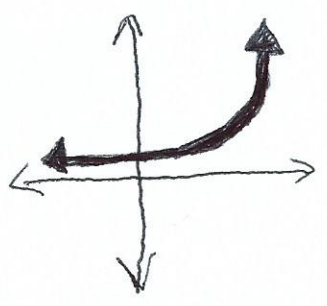
$f(x) = \frac{1}{x}$   
Reciprocal



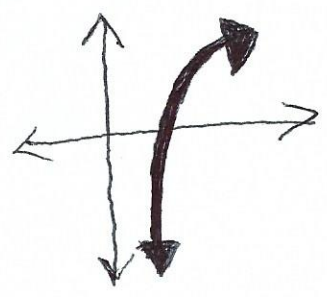
$f(x) = \frac{1}{x^2}$



$f(x) = e^x$   
exponential



logarithm  
 $f(x) = \ln(x)$



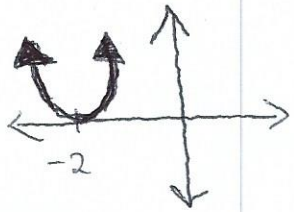
Graph Transformations

\*c is constant

1.) Horizontal shift:  $f(x \pm c)$     +: Left    -: right

(ex)  $f(x) = x^2$

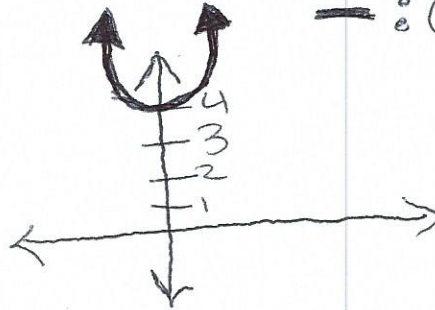
$g(x) = (x+2)^2 = f(x+2)$



2.) Vertical Shift:  $f(x) \pm c$   $+$ : Up  
 $-$ : down

(ex)  $f(x) = x^2$

$g(x) = x^2 + 4 = f(x) + 4$



3.) Vertical stretch/compression:  $c \cdot f(x)$

If  $|c| \gg 1$  stretches, if  $0 < |c| < 1$  compresses

4.) ~~Vertical stretch/compression~~ Horizontal stretch/compression:

$g(x) = f(c \cdot x)$

If  $|c| > 1$  compression

If  $0 < |c| < 1$  stretches

5.) Reflection about the y-axis

$g(x) = c \cdot f(x)$   $c < 0$