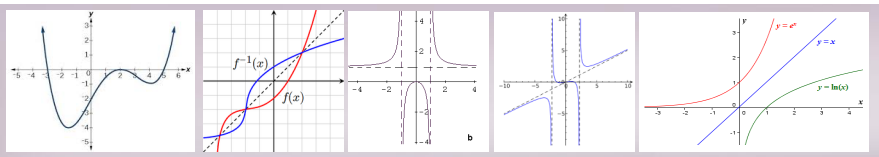


Math 1050 ~ College Algebra

$$-3x+4y=5$$
$$2x-y=-10$$
$$\begin{bmatrix}-3 & 4\\ 2 & -1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}5\\ -10\end{bmatrix}$$

$$\sum_{k=1}^{m} k=\frac{m(m+1)}{2}$$
$$\sum_{k=0}^{n} z^k=\frac{1-z^{n+1}}{1-z}$$

3 Transformations of Functions

Learning Objectives

- Graph functions using vertical and horizontal shifts.
- Graph functions using reflections about the x-axis and the y-axis.
- Graph functions using vertical and horizontal scalings.
- Graph functions using a combination of transformations.

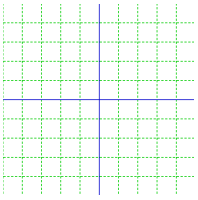
Transformations of Functions

Types of transformations from $y = f(x)$ to $y = Af(Bx - C) + D$

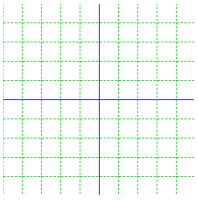
Shifts		Examples
Vertical	$h(x) = f(x) + D$	$y = x^2 + 2$
Horizontal	$g(x) = f(x-C)$	$y = (x-1)^3$
Reflect		
Vertical	$h(x) = -(f(x))$	$y = -x^2$
Horizontal	$g(x) = f(-x)$	$y = \sqrt{-x}$
Stretch/shrink		
Vertical	$h(x) = A(f(x))$	$y = 5x^3$
Horizontal	$g(x) = f(Bx)$	$y = \sqrt{(½)x}$

Ex 1: Graph these functions.

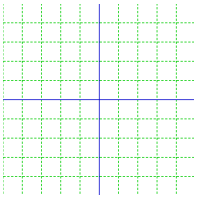
a) $y = -\sqrt{-x}$



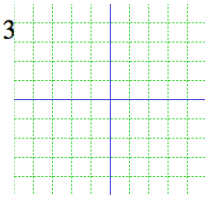
b) $y = |x-2|+1$



c) $y = -x^2 + 3$

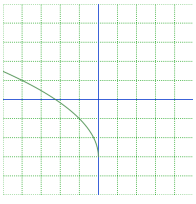


d) $y = \frac{1}{2}(x+1)^3 - 3$

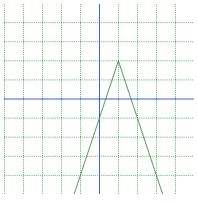


Ex 2: Write an equation for each of these graphs.

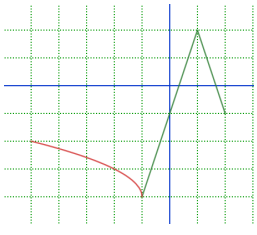
a)



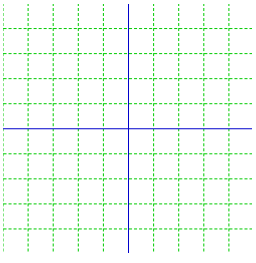
b)



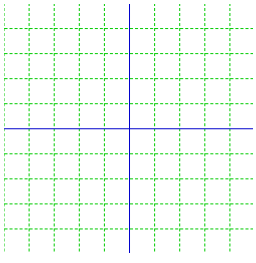
Ex 3: Given this graph for $f(x)$, sketch the graphs of the transformed functions.



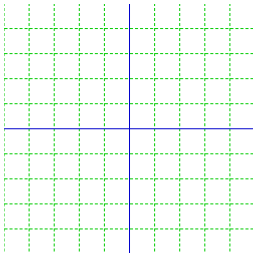
a) $f(-x)$



b) $f(x-1)+3$



c) $-2f(x)$



Ex 4: Describe transformations compared to the base toolkit graph for each of these.

a) $f(x)=2(x+1)^3-9$

b) $f(x)=-2\sqrt{x+1}+3$

It may be helpful to use the table method to sketch a graph with several transformations. Let's look at a way to sketch this function.

$$f(x)=\left(-\frac{1}{2}x-1\right)^3+3$$

Ex 5: Use the table method above to sketch this function.

$$f(x)=-3(x-2)^2+4$$