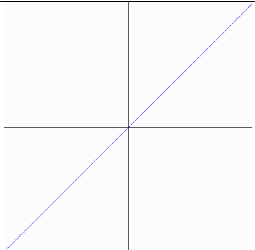
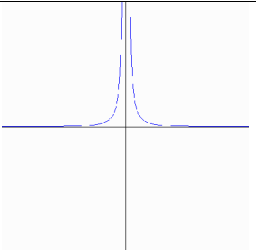
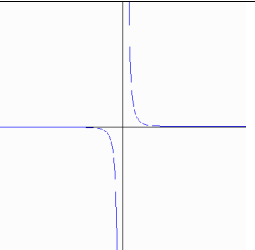


Table 1: Transformations				
Shift	Outside (after)		Inside (before)	
	$y = f(x) + c$	up	$y = f(x + c)$	left
Stretch: $ a > 1$	$y = f(x) - c$	down	$y = f(x - c)$	right
	$y = af(x)$	y-axis	$y = f(ax)$	x-axis
Shrink: $ a < 1$	$y = af(x)$	y-axis	$y = f(ax)$	x-axis
Reflection	$y = -f(x)$	x-axis	$y = f(-x)$	y-axis

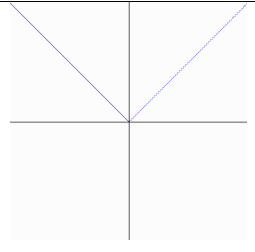
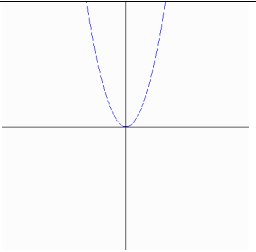
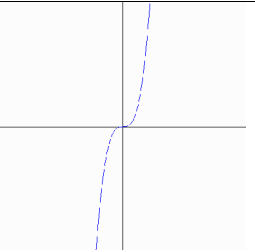
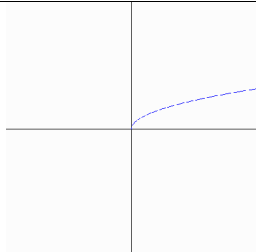
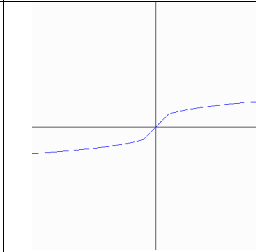
Table 2: Basic Un-Shifted Functions		
Linear $f(x) = mx + b$ Point: (0,0)	Reciprocal $f(x) = \frac{1}{x^n}$ Asymptotes: x-axis and y-axis	
	n is even	n is odd
		

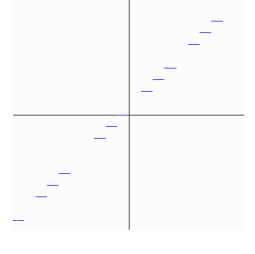
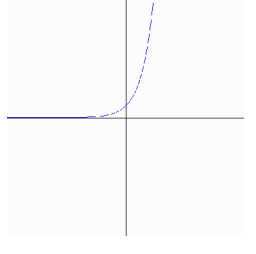
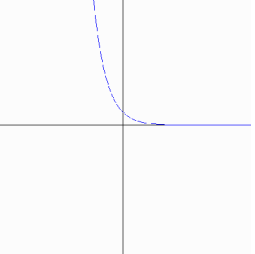
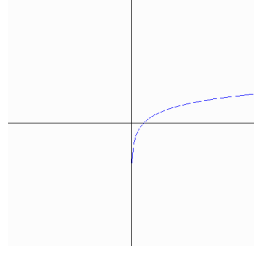
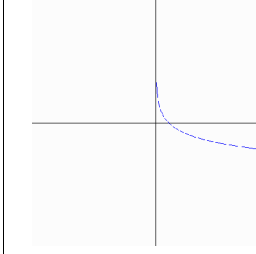
Step 1: Identify the un-shifted function, or basic function. Refer to Table 2. The chart will also identify a primary point and/or asymptotes.

Step 2: Compare the basic function to the one to be sketched and identify the transformations. Refer to Table 1.

Step 3: Plot the primary point and/or asymptotes at their shifted position.

Step 4: Sketch in the graph about the primary point and/or asymptotes.

Absolute Value $f(x) = x $ Point: (0,0)	Power $f(x) = x^n$ Point: (0,0)		Root $f(x) = \sqrt[n]{x}$ Point: (0,0)	
	n is even	n is odd	n is even	n is odd
				

Greatest Integer $f(x) = \lceil x \rceil$ Point: (0,0)	Exponential $f(x) = a^x$ Asymptote: x-axis		Logarithmic $f(x) = \log_a x$ Asymptote: y-axis	
	$ a > 1$ Point: (0,1)	$ a < 1$ Point: (0,1)	$ a > 1$ Point: (1,0)	$ a < 1$ Point: (1,0)
				

Chapter 3	Functions
Section 4	Transformations of Functions

Identifying Transformations

1. Are you adding or subtracting anything?

If yes, then you have a shift (translation).

If it is inside, then you have a shift in the x direction.

If it is outside, then you have a shift in the y direction.

2. Are you multiplying by anything?

If yes, then you possible have a stretch, shrink, or reflection.

Stretch/Shrink

Take the absolute value of the multiplier.

- If greater than 1, you have a stretch.
- If less than 1, you have a shrink.
- If equal to 1, then you have neither.

If it is inside, then you have a stretch/shrink in the x direction.

If it is outside, then you have a stretch/shrink in the y direction.

Reflection

If the multiplier is negative, you have a reflection.

If it is inside, then you have a reflection in the y direction. This means the y-axis or the vertical asymptote is the mirror. Use the asymptote if you have one.

If it is outside, then you have a reflection in the x direction. This means the x-axis or the horizontal asymptote is the mirror. Use the asymptote if you have one.