3.4 Transformations of Functions

* Standard Graphs
* Vertical shifts:

If is a positive real number,

shifts the original graph up units

shifts the original graph down units

* Horizontal shifts

If is a positive real number,

shifts the original graph horizontally to the right units

shifts the original graph horizontally to the left units

* Reflections:

About the -axis-The graph of is a reflection of the graph of about the -axis.

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Combinations of Transformation Order

1. Horizontal shifts
2. Horizontal stretches/compressions
3. Reflections about *y*-axis
4. Vertical stretches/compressions
5. Reflections about *x*-axis
6. Vertical shifts

Different ordering is possible for transformations 2 through 5, but you should always perform horizontal shifts first and vertical shifts last.

Graph each of the following and determine the shift

1. Use the graph of to sketch the graph of .
2. Use the graph of to sketch the graph of
3. Use the graph of to sketch the graph of .
4. Use the graph of to sketch the graph of .
5. Use the graph of to sketch the graph of .
6. Use the graphs of and to sketch the graph of .
7. Use the graphs of and to sketch the graph of .
8. Use the graph of to sketch the graph of