Precalculus

Lesson 2.5: Graphing Techniques: Transformations

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Transformations of Graphs

What we learned in Algebra II, $y = af(x-h)+k$ may be expanded one step further to include a horizontal stretch or compression and reflections over the y-axis. From the textbook is the table below:

SUMMARY OF GRAPHING TECHNIQUES

To Graph:	Draw the Graph of f and:	Functional Change to $f(x)$
Vertical shifts		
$y = f(x) + k,\ k > 0$	Raise the graph of f by k units.	Add k to $f(x)$.
$y = f(x) - k,\ k > 0$	Lower the graph of f by k units.	Subtract k from $f(x)$.
Horizontal shifts		
$y = f(x + h),\ h > 0$	Shift the graph of f to the left h units.	Replace x by $x + h$.
$y = f(x - h),\ h > 0$	Shift the graph of f to the right h units.	Replace x by $x - h$.
Compressing or stretching		
$y = af(x),\ a > 0$	Multiply each y-coordinate of $y = f(x)$ by a. Stretch the graph of f vertically if $a > 1$. Compress the graph of f vertically if $0 < a < 1$.	Multiply $f(x)$ by a.
$y = f(ax),\ a > 0$	Multiply each x-coordinate of $y = f(x)$ by $\frac{1}{a}$. Stretch the graph of f horizontally if $0 < a < 1$. Compress the graph of f horizontally if $a > 1$.	Replace x by ax.
Reflection about the x-axis		
$y = -f(x)$	Reflect the graph of f about the x-axis.	Multiply $f(x)$ by -1.
Reflection about the y-axis		
$y = f(-x)$	Reflect the graph of f about the y-axis.	Replace x by $-x$.

Movement opposite to sign

Determine the Function Obtained from a Series of Transformations

Given the parent function: $y = |x|$

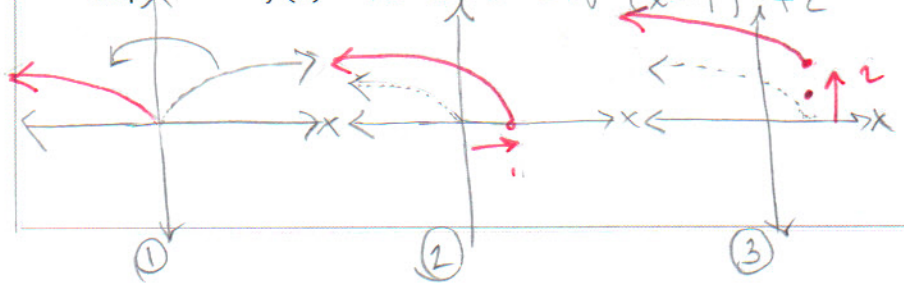
1. Shift left 2 units 2) Shift up 3 units. 3) Reflected about the y-axis.

$y = |x+2|$ $y = |x+2|+3$ $y = |-x+2|+3$

To graph a transformed function:

- Identify the parent function
- What is being done to the parent? Consider order of operation

Graph: $f(x) = \sqrt{1-x}+2 = \sqrt{-(x-1)}+2$



① Reflection about y-axis

② Horiz shift → 1

③ Vertical shift ↑ 2

Final