2.5 Graphing Techniques: Transformations

Transformations - taking graphs that we are fimiliar with and moving them around. Need to know the basic function graphs on Pgs.126-128.

Vertical Shift - moves graph up/down

y = f(x) is normal and y = f(x) + k moves the y-values by k units where k>0 moves graph up and k<0 moves the graph down.

Ex. 1 graph $h(x) = x^2 - 4$
we know $f(x) = x^2$ is a parabola and k = -4 which will move the y-values down 4 units. First graph/sketch $h(x) = x^2$ and then just move each point down 4 units.

Horizontal shift - moves graph left/right

$y = f(x)$ is normal and $y = f(x-h)$ moves the x-values by h units where $h<0$ moves the graph to the left and $h>0$ moves the graph to the right.

Ex. $y = (x-3)^2$ moves the x-values 3 units to the right.
$y = (x+2)^2$ moves the x-values 2 units to the left.

Ex. 2 graph $f(x) = (x+3)^2 - 5$
first graph/sketch $y = x^2$ then shift the graph.

Reflection about the x & y axis

About the x-axis: when the right side of the equation $y = f(x)$ is multiplied by -1 the new function $y = -f(x)$ is the reflection of the graph $y = f(x)$.

Ex. If $y = x^2 - 4$ then $-f(x) = -(x^2 - 4)$ which equals $-x^2 + 4$

About the y-axis: $y = f(-x)$ is the reflection of the graph $y = f(x)$.

Ex. If $y = x+1$ then $f(-x) = -x+1$

Compressions & Stretches

Vertically compressed or stretched (thinner/wider): when the right side of a function $y = f(x)$ is multiplied by a positive # (a) the new function $y = a\,f(x)$ is obtained by multiplying each y-coordinate by (a).

if $0<a<1$ vertically compressed (wider) and **if $a>1$ then it's vertically stretched** (thinner).

If the argument (x) of a function $y = f(x)$ is multiplied by a positive # (a) the new function $y = f(ax)$ is obtained by multiplying each x-coordinate of $y = f(x)$ by **1/a**

If $a>1$ horizontal compression and **if $0<a<1$ horizontal stretch.**

A summary is given on pg. 142.

Ex. 3 Find the function that is finally graphed after the following 3 transformations are applied to the graph of $y = |x|$. Use $y = (x-h) + k$ for the transformation.

1. shift left 2 units
2. shift up 3 units
3. reflect about the y-axis