Algebra II Notes
Properties of Functions
SOL 8, 10, 15

AII.8 **The student will recognize multiple representations of functions (linear, quadratic, absolute, value, step, and exponential functions) and convert between a graph, a table, and a symbolic form. A transformational approach to graphing will be employed through the use of graphing calculators.**

AII.10 **The student will investigate and describe through the use of graphs the relationships between the solution of an equation, zero of a function, x-intercept of a graph, and factors of a polynomial expression.**

AII. 15 **The student will recognize the general shape of polynomial, exponential, and logarithmic functions. The graphing calculator will be used as a tool to investigate the shape and behavior of these functions.**

Algebra II Notes on Properties of Functions (part 1)

This topic covers 3 SOL's--#8,10,15. Because they are so interrelated, they will be considered as one topic. Today you will be considering these two items:

1- You will need to be able to recognize various functions by their graph.
- Linear functions
- Quadratic functions
- Absolute value functions
- Exponential functions
- Step functions (though you will not sketch them today)

2- You will need to describe the transformation of several of these functions as compared to the base function.

Type 1 Linear Functions

Graph the function f(x) = x in your calculator, sketch the graph on your paper, and label it **"Base function for linear functions."**

Sketch each function and describe its transformation.

Note: Linear functions only move up or down along the y-axis. They may have a different slope

a) $y = x + 4$

b) $f(x) = x - 3$

c) $g(x) = 3x$

d) $y = 2x - 1$

Type 2 Quadratic Functions

Graph the function $f(x) = x^2$ in your calculator, sketch this graph on your paper, and label it **"Base function for quadratic functions."**

Sketch each function below and describe its transformation.

a) $y = x^2 + 4$

b) $f(x) = (x - 3)^2$

c) $g(x) = 3x^2$

d) $y = 2(x-1)^2 + 4$

e) $y = -x^2 + 5$

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

Type 3 Absolute Value Functions

Graph the function $f(x) = |x|$ in your calculator. Sketch this graph on your paper and label it **"Base function for absolute value functions.**

Now sketch the graphs of the functions below and describe their transformation from the base function.

a) $y = |x| + 4$

b) $f(x) = |x - 3|$

c) $g(x) = |3x|$

d) $y = 2|x - 1| + 4$

e) $y = -|x| + 5$

f) $y = -\frac{1}{2}|x + 3| - 1$

Type 4 Exponential Functions

Graph the function $f(x) = 2^x$ in your calculator and sketch it on your paper.

You will not need to use a base function or do transformations with this function—just be sure you can recognize it.

Type 5 Step Functions

You will not need to graph or use transformations for this function, but you should know what its equation and its graph looks like so:

1) $y = [x]$ When written in the bracket mode, it is actually called "the greatest integer function."

2)
$$y = \begin{cases} -3 & \text{when } x < 2 \\ 5 & \text{when } x = 2 \\ 8 & \text{when } x > 2 \end{cases}$$

Now for some **practice recognizing functions**. Jot down the type of function shown by each equation.

a) $y = 8^x$

b) $y = 7x + 3$

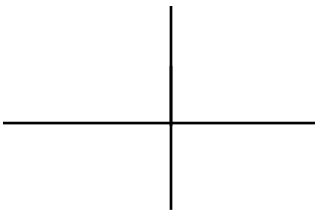
c) $y = 3|x - 2| + 7$

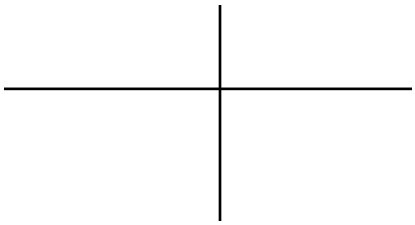
d) $y = [4x + 1]$

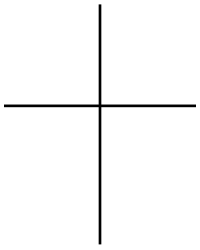
e) $$y = \begin{cases} 1 \text{ if } x < 0 \\ 2 \text{ if } x = 0 \\ 3 \text{ if } x > 0 \end{cases}$$

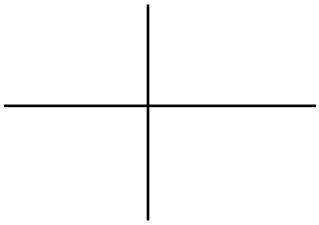
f) $y = -2(x - 3)^2 + 7$

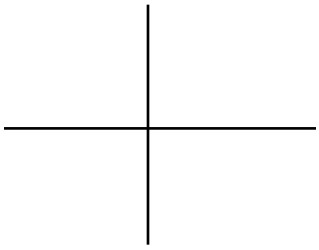
Jot down the type of function shown by each equation or graph.

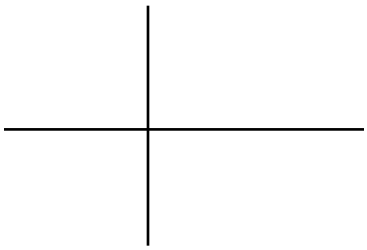
g) 

h) 

i) 

j) 

k) 

l) 

Describe each transformation:

a) $y = 3(x + 4)^2 - 5$

b) $y = -|x + 2| + 4$

c) $y = 2x - 7$

d) $y = -x^2$