Precalculus
Lesson 2.5: Graphing Techniques: Transformations
Lesson 2.6: Mathematical Models: Building Functions
Mrs. Snow, Instructor

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. 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		
$y = f(x) + k, \quad k > 0$	Raise the graph of f by k units.	Add k to $f(x)$.
$y = f(x) - k, \quad k > 0$	Lower the graph of f by k units.	Subtract k from $f(x)$.
Horizontal shifts		
$y = f(x + h), \quad h > 0$	Shift the graph of f to the left h units.	Replace x by $x + h$.
$y = f(x - h), \quad h > 0$	Shift the graph of f to the right h units.	Replace x by $x - h$.
Compressing or stretching		
$y = af(x), \quad a > 0$	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.
$y = f(ax), \quad a > 0$	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 $-x$.

Determine the Function Obtained from a Series of Transformations

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

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

Graphing Using Transformations (what is the parent function?)

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

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

Lesson 2.6

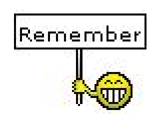
Real-world problems often result in mathematical models that involve functions. Using the information given, we can draw a picture of what the situation looks like and then translate the situation into a mathematical equation to solve. AND!! Calculators often make calculating the solutions easier.

Find the distance from the point P to O the origin.
$P = (x, y)\ is\ a\ point\ on\ teh\ graph\ of\ y = x^2 - 1$
a) Express the distance *d* from *P* to the origin *O* as a function of *x*
b) What is $d, if\ x = 0$?
c) What is $d\ if\ x = 1$?
d) What is $d\ if\ x = \frac{\sqrt{2}}{2}$?
e) Graph the function $d = d(x)\ for\ x \geq 0$ round 2 decimal places, find the local minimum

A rectangle has one corner in quadrant I on the graph of $y = 25 - x^2$, another at the origin, a third on the positive y-axis, and a fourth on the positive x-axis. *WHAT??? Well, draw a picture!*

a) Express the area *A* of the rectangle as a function of *x*
b) What is the domain of *A?*
c) Graph $A = A(t)$
d) For what values of *x* is the area largest?

Suppose two planes flying at the same altitude are headed toward each other. One plane is flying due South at a groundspeed of 400 MPH and is 600 miles from the potential intersection point of the planes. The other plane is flying due West with a groundspeed of 250 MPH and is 400 miles from the potential intersection point of the planes. ???



draw a picture.

a) Build a model that expresses the distance *d* between the planes as a function of time *t.*
b) Use a calculator to graph $d = d(t)$
   How close do the planes come to each other?
   At what time are the planes the closest?