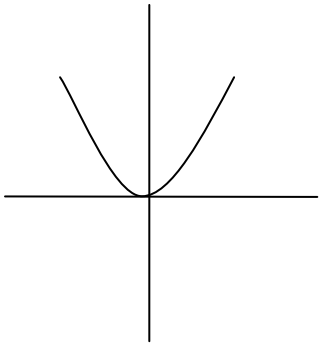
Total Recall (Warm-up) (5 minutes approx.)

Total Recall: Exercise from a previous lesson on functions and graphing.

Complete the following table and graph the function $y = x^2$:

x	y
0	
1	
2	
-1	
-2	



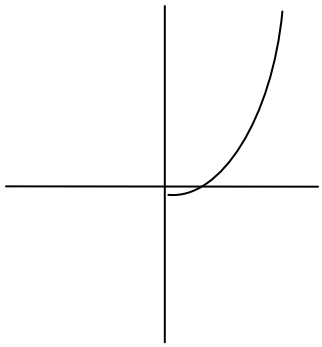
y
0
1
4
1
4

Activity: (15 minutes approx.)

Items needed: stopwatch and tennis balls or pillows or erasures.

Drop a tennis ball or pillow from the heights in the table. Record your times and plot the averages: Let the x axis be time and y axis height.

Height	Drop #1	#2	#3	AVG
0 m	0 sec	0 s	0 s	0 s
0.5 m				
1.0 m				
1.5 m				
2.0 m				

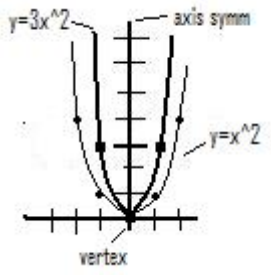


Compare your plot with the function: $y = 4.9\ x^2$ This function uses the physical rule that gravity is 8.9 m/s^2 and the average of a dropped object is one half the starting velocity (0) plus the ending velocity (gravity: 8.9 m/s^2) or (1/2)(0 + 8.9) = 4.9 m/s^2 . The distance equals acceleration times time squared or h = velocity · seconds^2 or height = 4.9 m/s^2 · s^2.

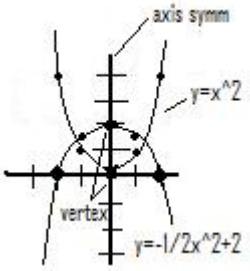
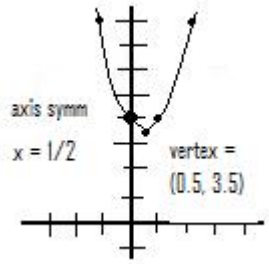
Review and Direct Instruction (10 minutes approx.)

The last section of class study was linear equations: $y = mx + b$.

Now we will investigate "quadratic" equations: $y = ax^2 + bx + c$; which is written in the 'standard form'. Compare $y = x^2$ to $y = 3x^2$. Plot the two and make your observations: Okay to make tables for each function.



The vertex is the point where the plot starts its symmetry. The axis of symmetry is the axis that divides the plot into two symmetrical shapes. In this case the vertex is point (0, 0) and the axis of symmetry is the x

	axis. Comparing the two, the higher the coefficient number on the x^2 term, the narrower the plot or the more closer to the x-axis it is.
Practice and assessment: (7 minutes approx.)	Finish the table for the following functions and then plot and compare them.  Compare $y = x^2$ to $y = -(1/2)x^2 + 2$: The vertex for $y = x^2$ is (0, 0) and for $y = -(1/2)x^2 + 2$ is (0, 2). Both have the x-axis as their axis of symmetry. The $y = -(1/2)x^2 + 2$ function has a wider curve from the vertex. Check all students to ensure they can plot and see the difference in the two functions. **New Terms**: Minimum and maximum. $y = -(1/2)x^2 + 2$ has a maximum y value of the vertex at (0, 2), which is called a maximum for the function. $y = x^2$ has a minimum at (0, 0). All y values or f(x) values are larger than at (0, 0).
Direct Instruction; practice: (8 minutes approx.)	Fill in the table and graph the quadratic function: $y = f(x) = 2x^2 – 2x + 4$. For the table, use 'x' values of -1, 0, 1, and 2. Corresponding y values are: 8, 4, 4, and 8. Since there are two of the same y values (4) for two x values of 0 and 1, what would be another x value to check to verify where the vertex is? Answer is 0.5, because it is between the two and it is symmetric.  There is a formula for the axis of symmetry when the quadratic is in the form of $y = ax^2 + bx + c$; axis of symmetry = $\frac{-b}{2a}$; and in this case we check to see if we get the same value from the graph: $x = 2/(2\cdot2) = ½$. You still must know if the relationship is a function, it's basic shape and if it is symmetrical in order to use this formula.
Exercise: (5 minutes approx.)	U-DO: Determine if these quadratics have a maximum or minimum and why? 1. $y = f(x) = x^2 – 2x -1$ Answer: Minimum, because the positive coefficient on the x squared term means that the function opens upward. 2. $y = f(x) = (-1/3)x^2 – 5x + 2$ Answer: Maximum, because the negative coefficient on the x squared term means that the function opens downward.

Wrap-up and homework assignment (5 minutes approx.)	Wrap up closing comments and housekeeping.