1. Carefully sketch on graph paper the graph of the equation $f(x) = -3x^2+7x$ over the window
   $-1 \le x \le 3$ and $-10 \le f(x) \le 5$. Grid paper can be downloaded from our class website.
   a. Find the average rate of change of the function between x= -1 and x = 3. Sketch the corresponding secant line on the graph. Label the line a.
   b. Find the average rate of change of the function between x=0 and x=2.
   c. Find the instantaneous rate of change at x=0 by sketching the tangent line at x=0 and finding the slope by estimating points on the line. Label the line c and show all work.
   d. Find the instantaneous rate of change at x=2 by using a numerical approach and filling in the following table. Be sure to state your answer. Use at <u>least 6 decimal places</u> in $f(x_2)$.

x_1	$f(x_1)$	x_2	$f(x_2)$	Slope of secant: $\frac{f(x_2)-f(x_1)}{x_2-x_1}$
2		1.9		
2		1.99		
2		1.999		
2		2.1		
2		2.01		
2		2.001		

   e. Find the instantaneous rate of change at x= -3 using the numerical approach. Make your own table such as the one in d with appropriately changed numbers.
2. Carefully sketch a graph of the curve $f(x) = \sin(x)$ over the interval $-2\pi \le x \le 2\pi$ (Your calculator must be in RADIAN mode.)
   a. List at least three points for which the slope of the tangent line is zero.
   b. Find the instantaneous rate of change at x=0 by sketching the tangent line at x=0 and finding the slope by estimating points on the line.
   c. Use the numerical method with a table to estimate the slope of the tangent line at x=0. Show all work and values used.
   d. Repeat b using the point $x = \pi$
   e. Repeat c using the point $x = \pi$ (SKIP _ SAME AS LAST)
   f. The domain for $f(x) = \sin(x)$ is all real numbers. List 10 other x values for which you expect the tangent line at x to have the same slope as the tangent line at 0.
   g. The domain for $f(x) = \sin(x)$ is all real numbers. List 10 other x values for which you expect the tangent line at x to have the same slope as the tangent line at π.
   h. Based on your work can you guess a formula for the instantaneous rate of change of sin(x) at any value x? (Hint: Try graphing the points and the slope of the tangent lines you found in f and g and sketching in the curve – does it look familiar?)