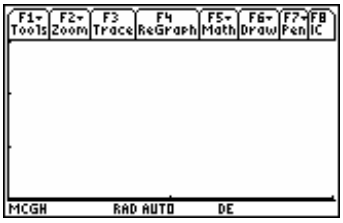
Assignment 19: Euler's Method (7.3) **Name**_____
Please provide a handwritten response.

1a. In this assignment you will look at applying Euler's Method to the differential equation $y' = \sin y - x^2$. If you want to find the value of y' at the point $\left(-3, \frac{\pi}{2}\right)$ you can evaluate it by entering $z = \sin(y) - x \wedge 2 \mid x = -3 \text{ and } y = \frac{\pi}{2}$. Find this value for $z = y'$ and record your result below.

1b. You can draw a direction field for this differential equation on your calculator as follows:

	TI-89	**Voyage 200**
DRAWING A DIRECTION FIELD	Set **MODE** to **DifEq** and enter the equation using **t** for **x** and $y1'$ for **y. GRAPH** $y1'(t)$ Specifically put $y1' = \sin(y1) - t^2$ Set **F1 9 (FORMAT)** to **Euler (Solution Method) and SlpFld (Fields).** Set **initial conditions** to **t0= 0** Set **WINDOW tMin=0,tMax = 2,** tStep=.1,tPlot=0,xMin=0, xMax=2,xScl=1,yMin=1, yMax=3,yScl=1 **GRAPH**	**Define** $f(x,y) = \sin(y) - x^2$ **and** $y1(x) = f(x,y)$ **Highlight** $y1(x)$ and press **F4** to deselect ***y*1.** **Set WINDOW** values. Here set $0 \le x \le 2,\ 1 \le y \le 3$ Run the program **slopefld( )** **Save the picture. 2ND PRGM (DRAW) STO 1:StorePic 1 ENTER**

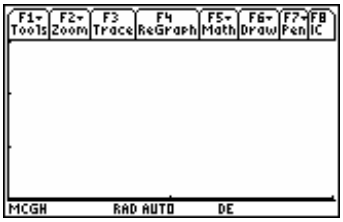
Roughly sketch the resulting direction field on the axes supplied below.



$0 \le x \le 2, 1 \le y \le 3$

1c. You can now plot the ordered pairs for Euler's Method on your calculator by **first enter**ing the line **Define** $f(t,y) = \sin(y) - t \wedge 2$ on your home screen and pressing enter. You can then run the program **eulerapp( )** and follow the prompts. The calculator will ask you to enter the initial values of

$t_0 = 0$, $y_0 = 2$, **step size =.1, and number of points** $= 20$. Run this program and record your results on the graph below.



$0 \le x \le 2, 1 \le y \le 3$

1d. To generate a table of the ordered pairs using Euler's Method to solve $y' = sin(y) - x^2$ on your calculator you can **Trace** the graph from **1c** by pressing **F3** with the graph displayed and moving the cursor with the arrow keys. The values of **t** and **y** will be displayed on the bottom of the screen. What is the value of $y(1)$ using this approximation**?** What is the value of $y(2)$ using this approximation? Record your results below.

1e. Repeat **1c** and **1d** using a step of 0.05 and compute the first 40 iterations. Record the values of $y(1)$ and $y(2)$ **.**

1f. Now plot both the field plot and the Euler function together and record your result on the graph in **1b**. You can do this on your calculator as follows:

	TI-89	**Voyage 200**
GRAPHING A SLOPEFIELD WITH A FUNCTION	Graph the slopefield as in **1b**. Go to ♦**Y=** and add the initial conditions $t0 = 0$ (above $y1'$) and $yi1 = 2$. Press ♦ **GRAPH**	Graph the slopefield as in **1b** by running the program **slopefld( )** Immediately run the program **eulerapp( )** as in **1c.** The graphs will appear together.