

Assignment 18: Euler's Method (7.3)
Please provide a handwritten response.

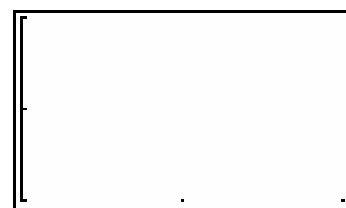
Name _____

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 use the **SOLVER** (see assignment 3) to enter $z = \sin y - x^2$ (TI-86) or $0 = Z - \sin(Y) + X^2$ (TI-83 Plus/TI-84 Plus). Assign $x = -3, y = \frac{\pi}{2}$. Solve for $z = y'$ by placing the cursor on z and pressing **SOLVE**. Find this value for $z = y'$ and record your result below.

1b. Your calculator will draw a direction field for this differential equation as follows:

	TI-83 Plus/TI-84 Plus	TI-86
DRAWING A DIRECTION FIELD	<p>Put Y' in Y_1. Specifically put $Y_1 = \sin(Y) - X^2$</p> <p>Move cursor to on top of = and press enter to deselect it.</p> <p>Set WINDOW values. Here set $0 \leq X \leq 2, 1 \leq Y \leq 3$</p> <p>Run the program FLDPLOT</p> <p><u>Save the picture.</u> 2ND PRGM (DRAW) STO 1:StorePic 1 ENTER</p>	<p>Set MODE to DifEq and enter the equation using t for x and Q1 for y. GRAPH $Q'(t)$</p> <p>Specifically put $Q'1 = \sin(Q1) - t^2$</p> <p>Set FORMAT (GRAPH MORE FORMAT (F1)) to Euler SlpFld</p> <p>Set initial conditions INITC (F3) to 0</p> <p>Set WINDOW tMin=0,tMax = 2, tStep=.1,tPlot=0,xMin=0, xMax=2,xScl=1,yMin=1, yMax=3,yScl=1,Estep=1</p> <p>GRAPH (F5)</p>

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



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

1c. You can generate a table of ordered pairs using Euler's Method to solve the differential equation $y' = \sin y - x^2$ on your calculator.

	TI-83 Plus/TI-84 Plus	TI-86
GENERATING AN EULER TABLE	<p>Put Y' in Y_1. Specifically put $Y_1 = \sin(Y) - X^2$</p> <p>Run the program EULTBL.</p> <p>Enter an initial value for X and Y at the prompts. In</p>	<p>Set MODE to DifEq and enter the equation using t for x and Q1 for y. GRAPH $Q'(t)$</p> <p>Put $Q'1 = \sin(Q1) - t^2$</p>

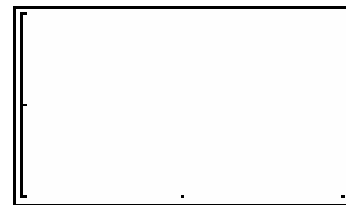
	<p>this case enter $X=0$ and $Y=2$.</p> <p>Enter a step size of $.1$ at the prompt to give you 20 steps starting from $X=0$.</p> <p>Enter 20 when asked for the number of points.</p>	<p>Set FORMAT (GRAPH MORE FORMAT (F1)) to Euler FldOff</p> <p>Set Axes: $x=t, y=Q$</p> <p>Set initial conditions INITC (F3) $tMin=0, QI1=2$</p> <p>Set up table TABLE TBLST (F2) TblStart =0 $\Delta Tbl=.1$ Indpnt: Auto TABLE (F1)</p>
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According to this table, what is the value of $y(1)$ using this approximation? What is the value of $y(2)$ using this approximation? Record your results below.

1d. This list can be plotted on your calculator as follows.

	TI-83 Plus/TI-84 Plus	TI-86
<p>GRAPHING AN EULER PLOT</p>	<p>Put Y' in Y_1. Specifically put $Y_1 = \sin(Y) - X^2$.</p> <p>Run the program EULGRPH.</p> <p>Enter an initial value for X and Y at the prompts. In this case enter $X=0$ and $Y=2$.</p> <p>Enter a step size of $.1$ at the prompt</p>	<p>Set MODE to DifEq and enter the equation using t for x and $Q1$ for y. GRAPH $Q'(t)$</p> <p>Specifically put $Q'1 = \sin(Q1) - t^2$</p> <p>Set FORMAT to Euler FldOff GRAPH MORE FORMAT (F1)</p> <p>Set WINDOW $tMin=0, tMax = 2, tStep=.1, tPlot=0, xMin=0, xMax=2, xScl=1, yMin=1, yMax=3, yScl=1, Estep=1$</p> <p>GRAPH (F5)</p>

Record your results on the graph below.



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

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.

	TI-83 Plus/TI-84 Plus	TI-86
<p>GRAPHING THE EULER FUNCTION ON THE FIELD PLOT</p>	<p>Edit EULGRPH by adding the line RecallPic 1 as line 4 of the program (immediately following ClrDraw)</p>	<p>GRAPH MORE FORMAT and turn on SlpFld. Now press GRAPH (F5).</p>