Name: ______________________________

MATLAB Assignment #1

Slope Fields and Euler's Method

1. For the following differential equations

$$y'(t) = \cos(y) + \sin(t) \quad (1)$$
$$y'(t) = y * (2 - y) \quad (2)$$

a) Modify the function *F.m* in MATLAB to match the given differential equation above.

b) Use the file *ExampleSlopeField.m* to generate a slope field of the differential equation, and print out your figure. Constrain the dimensions of your plot to be $-4 \leq y \leq 4$ and $-4 \leq t \leq 4$ and the spacing between the slope lines should be 0.5.

c) On your printed out slope field, sketch the solution of the differential equation at the following points:

1. $(y_1, t_1) = (-2, -1.5)$
2. $(y_2, t_2) = (-1, -0.5)$
3. $(y_3, t_3) = (0, 4)$

d) For each of the initial points above, continue the solution curve backwards in time to see where the initial point originated from.

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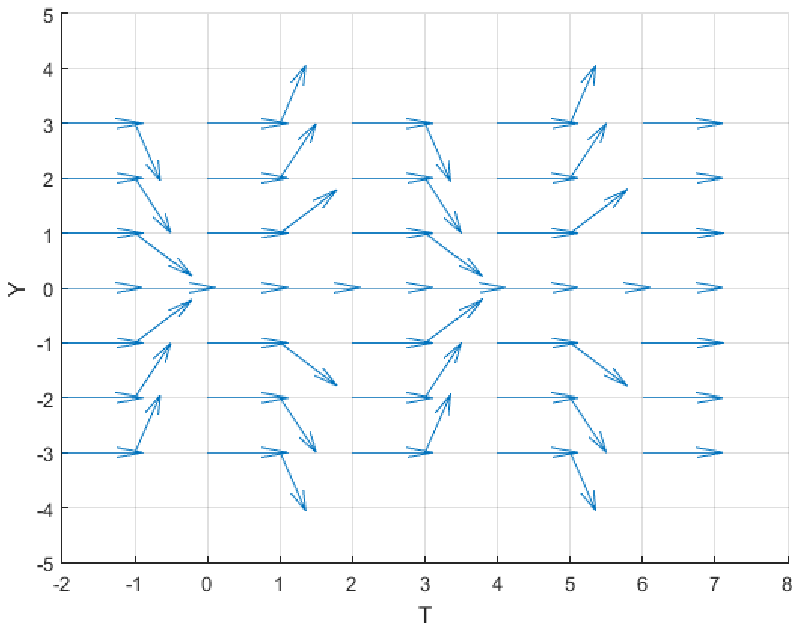
2. Below is a slope field for the differential equation $y'(t) = y * \sin(t * \pi/2)$.



a) Modify the function $F.m$ in MATLAB so that it is defined as $F(t, y) := y * \sin(t * \pi/2)$. Use this function in the command window to help you compute Euler's method for 6 steps starting at $(y_0, t_0) = (1, 0)$ with step size 1. Plot your result on the graph above.

k	t_k	y_k	$f(t_k, y_k)$
0			
1			
2			
3			
4			
5			
6			

b) Modify the *ExampleEuler.m* file so that you numerically integrate the initial condition $(y_0, t_0) = (1, 0)$ until time $t = 25$. Do this for step sizes 0.5, 0.1 and 0.01.

c) For each of the step sizes, what is the value Euler's method produces for $y(25)$? Include three significant digits. What pattern do you notice?