Math 2208: Ordinary Differential Equations

Lecture 4 Recap
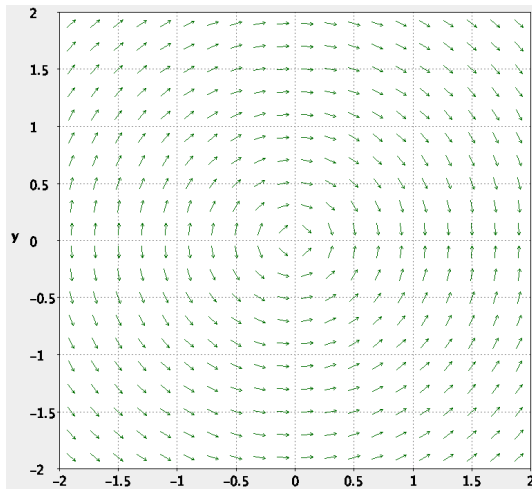

Fall 2019 | **Subhadip Chowdhury** | **Sep 18**

TITLE: Slope Field and Euler's Method

■ Question 1.

x	y	y'	Δy

Consider the differential equation $y' = -t/y$ with initial condition $y(0) = 1.$ Given that the exact solution is $y(t) = \sqrt{1-t^2}$,

a) use the slope field to estimate $y(1/2)$ for the solution that satisfies the given initial condition.

b) Compare your estimate with the exact value of $y(1/2)$.

c) Use Euler's Method with $\Delta t = .25$ to estimate $y(1/2)$.

d) Is your Euler's Method estimate and over-estimate or under-estimate? Explain why.

■ Question 2.

Complete the following sentences:

a) As the time step Δt _____ in magnitude, the numerical error in computing $y(t_1)$ using Eulers Method decreases in magnitude.

b) As the time step Δt _____ in magnitude, the numerical error in computing $y(t_1)$ using Eulers Method increases in magnitude.

c) When y' is _____ on $t_0 < t < t_1$ the function $y(t)$ is concave up and estimates of $y(t_1)$ using Eulers Method will be _____.

d) When y' is _____ on $t_0 < t < t_1$ the function $y(t)$ is concave down and estimates of $y(t_1)$ using Eulers Method will be _____.