Class 7

Wednesday September 16

Practice with Euler's Method

Example

Recall that in *Class #5* we were given the following rate equation: $y' = 1 + \sqrt{y}$.

(a) We want to know what the rate of change of y when $y = 1.8$

(b) Suppose that when $t = 0, y = 1.8$, use Euler's Method with $\Delta t = .25$ to find $y(1)$

GROUPWORK

Today we will be doing a number of calculations in small groups. The point of these exercises is for each of you to get even more hands-on experience with computing solutions using **Euler's Method**.

(a) $y' = 1 + y^2, \quad y(0) = 0, \quad \Delta t = .25$ or $.5$ with $t \in [0, 2]$

(b) $y' = 2\sqrt{y}, \quad y(1) = 1, \quad \Delta t = .25$ or $.5$ with $t \in [1, 3]$

(c) $y' = e^{-y}, \quad y(2) = 0, \quad \Delta t = .25$ or $.5$ with $t \in [2, 4]$

(d) $y' = y + 3, \quad y(0) = -2, \quad \Delta t = .5$ or 1 with $t \in [0, 4]$

(e) $y' = \dfrac{1}{2y}, \quad y(1) = 1, \quad \Delta t = .5$ or 1 with $t \in [1, 5]$

DIRECTIONS

Form groups of 3 or 4. Choose one of the rate equations (above) and a value of Δt and then compute **four steps** of Euler's Method to approximate the solution of the rate equation. Fill out the table below.

t	y	y'	Δy

In *Class #6* we were introduced to the S-I-R Model of disease.

$$\begin{array}{rcrrr} S' & = & -.00001SI, & & S(0) = 45400 \\ I' & = & .00001SI & - \ 1/14I, & I(0) = 2100 \\ R' & = & & 1/14I, & R(0) = 2500 \end{array}$$

Let's confirm our calculations of how S, I and R change with time over the space of 4 days by approximating the solution of the model by using Euler's Method with $\Delta t = 1$ day

t	S	I	R	S'	I'	R'	ΔS	ΔI	ΔR

ANNOUNCEMENTS

REMINDER Exam #1 is scheduled for **Thursday September 24** in your lab section

HOMEWORK DO Page 52 in *CiC* **5, 6, 7** to hand in Fri Sep 18.