MAP2302: Differential Equations.

http://www.imathesis.com/map2302.html

Practice 2

Topics: The approximation Method of Euler. Rationale. Examples. Problems.

Note: Euler's method is a procedure for constructing approximate solutions to an initial value problem for a first order differential equation: $y' = f(x, y)$, given $y(x_0) = y_0$ using the recursive formulas $x_{n+1} = x_n + h$ and $y_{n+1} = y_n + hf(x_n, y_n)$, where h is the step size.

I. Questions to be discussed in class:

1. Consider the initial-value problem $y' = 0.1\sqrt{y} + 0.4x^2$, $y(2) = 4$. Use Euler's method to obtain an approximation of $y(2.5)$ using $h = 0.1$

Verify your results:

x_n	y_n
2.00	4.0000
2.10	4.1800
2.20	4.3768
2.30	4.5914
2.40	4.8244
2.50	5.0768

2. Use Euler's method to obtain a four decimal approximation of the indicated value. Use $h = 0.10$:

a) $y' = 2x - 3y + 1$, $y(1) = 5$; $y(1.2)$

b) $y' = x + y^2$, $y(0) = 0$; $y(0.2)$

c) $y = e^{-y}$, $y(0) = 0$; $y(0.5)$

d) $y' = (x - y)^2$, $y(0) = 0.5$; $y(0.5)$

e) $y' = xy^2 - \dfrac{y}{x}$, $y(1) = 1$; $y(1.5)$

f) $y' = y - y^2$, $y(0) = 0.5$; $y(0.5)$