APMA 0350 – HOMEWORK 4

Problem 1: (5 points)

Apply Euler's method **by hand** with $N = 4$ to find y_0, y_1, y_2, y_3, y_4 on $[0, 1]$ where

$$\begin{cases} y' = -2y + 3t \\ y(0) = 1 \end{cases}$$

Note: Please don't use Python for this. You **are** allowed to use a calculator do the arithmetic and to use approximate values.

Problem 2: ($5 = 3 + 2$ points) Solve the following **exact** ODE. Leave your answer in implicit form. Don't forget to check for exactness

(a)

$$\frac{dy}{dx} = -\left(\frac{e^x \sin(y) - 2y\sin(x)}{e^x \cos(y) + 2\cos(x)}\right)$$

(b)

$$\frac{dy}{dx} = -\left(\frac{f(x)}{g(y)}\right)$$

Note: Your answer will involve antiderivatives F and G of f and g respectively. This shows that exact equations are more general than separation of variables.

(Turn page)

Problem 3: ($5 = 2 + 2 + 1$ points)

Find the general solution of the following ODE:

(a) $y'' = y' + y$ (this involves a number called the golden ratio)

(b) $6y'' - 7y' + 2y = 0$

(c) An ODE whose auxiliary equation is

$$(r-1)r(r+1)(r+2) = 0$$

Problem 4: (5 points) Solve the following ODE

$$\begin{cases} y'' - 3y' - 28y = 0 \\ y(0) = 3 \\ y'(0) = -1 \end{cases}$$