Qn2 (10 marks)

Deadline 3 Sep (Sun), 2359 hrs

(a) Consider the 1st order IVP given by $\dot{Y} - 3Y = e^t \;\; , \;\; Y(0) = 0$

Exact solution: $Y = -0.5e^t + 0.5e^{3t}$

(b) Consider the 1st order IVP given by $\dot{Y} = Y^{1/3}\, t \;\; , \;\; Y(1) = 1$

Exact solution: $Y = [(t^2 + 2)/3]^{1.5}$

CE5377 students:

- Solve (a) using Euler Explicit method **and** the implicit Trapezoidal method.
- Explain how the implicit Trapezoidal method was implemented.
- Compare and contrast the accuracy and stability of the two methods.

CE6077 students:

- Solve (a) using Euler Explicit method.
- Solve (a) and (b) using the implicit Trapezoidal method.
- Compare and contrast the accuracy and stability of the two methods.
- When iterations are required with the implicit Trapezoidal method, use the Newton Raphson (NR) to determine the gradient term, i.e.:
    - Instead of analytically deriving the Jacobian in the NR method, use a numerical scheme to obtain it *numerically*.
    - *Explain* clearly the strategy adopted.