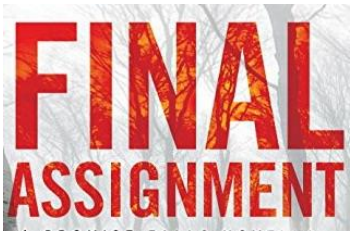
MATH 226

Differential Equations

Assignment 23

Due Monday, May 12



Read First two sections of Chapter 9: *Series Solutions* in Brannan and Boyce. This chapter is available online only at *https://bcs.wiley.com/he-bcs/Books?action=mininav&bcsId=9432&itemId=1118531779&assetId=385268&resourceId=37931&newwindow=true*

Problems

Problem A: Consider the Initial Value Problem $y' = 5 - 2y + t, y(0) = 1$

(a) Find the solution $\phi(t)$ of the differential equation and compute $\varphi(.1)$ and $\varphi(.2)$
(b) Estimate $y(.1)$ and $y(.2)$ by hand using
  (i) Euler's Method
  (ii) Improved (Heun) Method
  (iii) Runge-Kutta Method
(c) Compare the approximations from (b) with the exact solutions from (a)
(d) ***(Optional)*** Develop MATLAB programs to implement the numerical approximation methods of Euler, Heun and Runge-Kutta.

Problem B: Find a power series solution for each of the following differential equations:

(1) $y' = 3 - 2y$
(2) $y' = t + y$
(3) $y' = ty$