King Fahd University of Petroleum & Minerals
Department of Mathematics & Statistics
Math 571 Project
The First Semester of 2014-2015 (141)
Due Date: Final Exam Day

Name: _____ ID#: _____

Q:1 For the initial value problem $\frac{dy}{dx} = \frac{y+x}{y-x}, \quad y(0) = 1, \quad 0 \leq x \leq 2$ construct a fourth order Taylor method. Compute the numerical solutions for $N = 5, 10, 20, 40, 80$. Compute the absolute maximum error between exact solution $y = -x + \sqrt{1+x^2}$. Make a table of N, Error , and Order. Order can be computed by using log formula.

Q:2 Define general linear multi-step method. Construct 2 different Adam–Bashforth methods of order 3. Implement these methods to numerically solve the problem given in Question 1. Plot the graphs of the exact solution with the numerical solution for each method.

Q:3 Use Theorem 302B to find value θ_6, that is the number of threes with 6 vertices. Draw all these trees and denote them with square bracket notation. Label these trees with $a's$, $b's$ and $c's$. Find $\sigma(t)$, $\gamma(t)$, $\alpha(t)$ and $\beta(t)$ for each tree. Also write the polynomials $\Phi(t)$ for each tree.