2021 Num Analysis Midterm 2

Open book and notes. You may use a calculator. Compute up to 4 decimal digits. Show the intermediate processes for the partial credits.

1.(10pts) (2.0, 1.414214), (2.1, 1.449138), (2.2, 1.483240), (2.3, 1.516575), and (2.4, 1.549193) are 5 given points.

a) Construct a Newton's divided difference table for the above 5 points.

b) With this table, find the polynomial that interpolates the above 5 points.

c) With this polynomial find the value at x=2.25

2. (10pts) $y' = \cos(x*x) + y^2$, $y(0) = 1$.

For the above ODE for h = 0.1, perform 2 steps of Runge-Kutta method of order 4 to compute y(0.2).

4. (10pts) A = 5 0 -1
0 4 1
-1 1 4

b^T = [3 -2 6].

Let $X^0 = (0.8, 1.5, -1.2)$.

a) Perform 2 steps of Jacobi and Gauss-Seidel iterations to find X^2.