MAD 4401 TEST 1 FALL 2018 - JAMES KEESLING

Name: _____

Do all problems and show all work. Each problem worth 20 points. Partial credit will be given for correct work even if the answer is wrong. Credit will be deducted for incorrect work even though the final answer may be correct.

Problem 1. Determine a solution of the equation $x^5 - 2x^4 + 2x^3 - x^2 + x = 5$ using the Newton-Raphson method. Give your starting point and circle the final answer.

Problem 2. Let h be a continuous function $h : R^n \to R^n$. Let $x_0 \in R^n$. Suppose that $h^n(x_0) \to z$ as $n \to \infty$. Show that $h(z) = z$.

Problem 3. Determine the polynomial $p(x)$ of degree 5 passing through the points $\left\{(0,0),\left(\frac{1}{2},0\right),(1,1),\left(\frac{3}{2},0\right),(2,0),\left(\frac{5}{2},0\right)\right\}$.

Problem 4. Estimate $\int_0^1 \cos(x^3)dx$ using Romberg Integration using 2^5 subintervals. Give the first column of the result to 5 digits and the last two columns to 12 digits. Circle the best answer and say how many digits you feel are correct.

Problem 5. Determine the coefficients to compute the first derivative of $f(x) = \sin(x^2)$ at $a = 1$ using the points $\{a-3h, a-h, a, a+h, a+3h\}$. Give the estimate of the derivative as a function of h.