

MAD 4401 TEST 1 FALL 2018 - JAMES KEESLING

NAME _____

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

Problem 1. Solve the equation $\sin(x) \cdot (x^5 + 2) = \cos x$ by the Newton-Raphson method. Give the Newton function. Find a starting point for which the method converges. Give the starting point and the iterations with five digits accuracy. Give the final answer to twelve digits and circle the final answer.

Problem 2. Give the function $p(h)$ estimating the second derivative of $\sin(x^3)$ at $x = 1$ using the points $\{1 - h, 1, 1 + 3h\}$. Show what you think is best numerical estimate of this second derivative. Explain.

Problem 3 Determine the Lagrange polynomial through the points $\{(-1, 1), (1, -1), (2, 4), (3, 4), (5, -1)\}$.

Problem 4. Estimate $\int_0^2 \cos(x^3)dx$ using Romberg Integration using 2^7 subintervals. Give the first column of the result to 5 digits and the last two columns to 12 digits. Circle the best answer. How many digits are correct?

Problem 5. State the **Mean Value Theorem**. State the **Intermediate Value Theorem**. Give the formula for **Taylor Expansion** for a function $f(x)$ centered at a .