MAD 4401 PRACTICE TEST 2

JAMES KEESLING

Work all problems and show all work. Each problem is worth 20 points. Partial credit will be given for correct reasoning. Credit will be deducted for statements and reasoning that are incorrect.

Problem 1. Suppose that a certain bowler will produce a strike with probability .85, a spare with probability .10 and have an open frame with probability .05. Use the **bowling** program to estimate the probability that such a bowler will bowl 200 or greater in a game.

Problem 2. Consider the differential equation $\frac{dx}{dt} = t^2 \cdot x^3$ with $x(0) = 2$. Use three iterates of Picard Iteration to produce a polynomial that estimates the solution of the equation. Start with $x_0(t) \equiv 2$ and produce $x_1(t), x_2(t)$, and $x_3(t)$.

Problem 3. Give the coefficients to the derivative of a function f at a using the points $\{a - 2h, a, a + 3h, a + 4h, a + 5h, a + 6h\}$. What is the best h to use for the estimate? Assume that the calculator error in calculating $f(a)$ is approximately 10^{-15}. Estimate the error of this estimate of $f'(a)$.

Problem 4. Estimate the integral $\int_{-1}^{1} \exp x^2 dx$ using the Monte-Carlo method using 100 points. What is the error this estimate?

Problem 5. The human body has approximately 30×10^{12} erythrocytes. Each erythrocyte survives in the bloodstream approximately 120 days. Suppose that the number of erythrocytes produced by the bone marrow is α. Model this as a queueing system and determine α.