AMSC/CMSC 661 Quiz 1 , Spring 2005

Show all work. You may leave arithmetic expressions in any form that a calculator could evaluate. By putting your name on this paper, you agree to abide by the university's code of academic integrity in completing the quiz. During the quiz you may use your textbook, my notes, and your own notes. No communication with others and no calculators or other electronic devices are permitted.

Name _____

1. (10) Let $\bar{\Omega} = [0, 1]$ and let

$$u(x) = e^{5x} + x^2.$$

Evaluate $\|u\|_{L_2}$, $\|u\|_{\mathcal{C}}$, and $\|u\|_1$.

2. (10) Consider the differential equation

$$-u'' + 8.125\pi \cot((1+x)\pi/8)u' + \pi^2 u = -3\pi^2 \text{ on } \Omega = (0,1)$$

with boundary conditions $u(0) = -2.0761$, $u(1) = -2.2929$. Without using a Green's function or an explicit solution to the problem, tell me about the solution: Does it exist? Is it unique? What are upper and lower bounds on the solution? Justify each of your answers by citing a theorem and verifying its hypotheses. (Hint: One bound can be obtained by comparing the solution to $u(x) = -3$.)