AMSC/CMSC 661 Quiz 2 , Spring 2010

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. Use no calculators, cellphones, or any other electronic devices, and don't communicate with other students. You may use the Larsson&Thomèe textbook, anything taken from the course website, and your own notes.

Name _____

Recall that the derivative of $\ln(x)$ is $1/x$.

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

1a. (5) Give an example of a function $f(x)$ that is defined on $\Omega$ but not in $C(\Omega)$.

1b. (5) Let $g(x) = 1/\sqrt{x}$. Is $g(x) \in L_2(\bar{\Omega})$? Justify your answer.

2. (10 points) consider the problem

$$\mathcal{A}u = -(1 - \frac{x^2}{4})u''(x) - \frac{x}{2}u'(x) + \frac{1}{2}u = -2,$$

$$u(0) = 0, \;\; u(1) = 1.$$

Use the theorems in the book/notes to tell me as much as you can about the solution to this problem, without actually solving the problem. Hint: One bound on the solution can be obtained from using the monotonicity property to compare $u$ to the solution to $\mathcal{A}w = f$ where $w(x)$ is an appropriately-chosen constant.