Name ________________________ Score __________________

Spring 2005

MATH 582 Homework 5

Carefully Read and Follow Directions Clearly label your work and attach it to this sheet. No credit will be given for unsubstantiated answers.

1. Consider the functional $f(u)$ given in problem 2.5 on page 97 of your textbook.
   (a) Show that the functional is a quadratic functional. Be sure to correctly identify the set $\tilde{V}$.
   (b) Consider the case when $b < \pi$, and show that the function $\hat{u} = 0$ is the unique strong global minimizer of the functional f. Hint: begin by finding the stationary point.
   (c) Consider the case when $b = \pi$, and show that the functional f has a "family" of global minimizers given by $\hat{u}_c(x) = c \sin x$ for any real number c.
2. In Problem Problem 2 of Homework 4, you went through the specific calculations of the right-hand side vector for the test problem outlined there. In particular, your code "hard-wired" the right-hand side vector of integrals

$$b_i = \int_0^1 f(x)\phi_i(x)dx, \quad i = 1, 2, \ldots N.$$

   For this assignment, we take the a more general approach. Create a Matlab function which builds the right-hand side vector for a function $f(x)$. We just discussed this in class, and you will need to download a couple of functions from the class homepage. These m-files are *gauss.m* and *shape.m*. Continue to assume that the basis functions creating our approximation space S are the "hat functions." Consult your class notes for pseudo-code for constructing this vector.