CIVL.666, MANE.666
FUNDAMENTALS OF FINITE ELEMENTS

HOMEWORK 2
Due: September 20, 2018

Problems 1-3 are to be answered for the weak form constructed for the text book 1D ODE:

$$u_{,xx} + f = 0 \quad \text{on } \Omega$$

$$u(1) = g$$

$$-u_{,x}(0) = h$$

Problem 1 just forces you to go through details of what we did in class.

1. (To be graded) Redo Example 2 (2-degree of freedom problem) given in section 1.7 of the text book except this time repeat the calculation with the following shape functions

$$N_1(x) = 1 - 3x + 2x^2, \quad N_2(x) = 4x - 4x^2, \quad N_3(x) = 2x^2 - x$$

Be sure to discuss the ability of these shape functions to approximate the solution for the three forcing functions considered in the text (0, constant and linear).

2. What order polynomial shape functions are needed to get the exact solution for the following forcing function, $f = (2x^2 - 4x)$? (You do not have to solve for it, just indicate the correct polynomial order.)

3. If the forcing function also included a trigonometric term in it can we still get the exact solution by increasing the polynomial order of the element? Explain your answer.