AM466b/562b. Problem set 4.
FEM in 1d, integration.
Instructor: Dr. Karttunen.

Write out *all* the steps in your calculations.
If programming is needed, please provide a print of the source code.
Due: Mar. 30, 2007

Problem 1. Consider the problem of finding approximations to

$$\int_1^{1.5} e^{-x^2} dx,$$

whose value to seven decimal places is 0.1093643. Apply Gaussian quadrature.

Problem 2. Write a program to evaluate an integral $\int_a^b f(x)dx$ using

$$\int_{-1}^{1} f(x)dx \approx \frac{5}{9} f\left(-\sqrt{\frac{3}{5}}\right) + \frac{8}{9} f(0) + \frac{5}{9} f\left(\sqrt{\frac{3}{5}}\right).$$

See lecture notes for derivation.

Problem 3. Textbook problem N1 on page 78. Note: you don't have to use Matlab, other programming languages are are also acceptble.

Problem 4. Textbook problem N2 on page 78.

Problem 5. Textbook problem S11 on page 77.

The following problems are for grad students (and anyone else who wishes to try)

Problem 6. Textbook problem N7 on page 80.

Problem 7. Write a procedure for evaluating $\int_a^b f(x)dx$ by first subdividing the interval into n equal subintervals and then using the 3-point Gaussian formula from Problem 2 modified to apply to the n subintervals. The function f and the integer n will be furnished to the procedure.