CS 323E | **Homework 7** | **Due: Nov 9, 2000**

Submit MATLAB code and output by email to pauldj@cs.utexas.edu. The code will be tested. Derivations for 2(a) and 3(c) (and any other derivation) should be submitted on paper.

1. (10 points)
   Do Problem P3.3.10 from textbook.

2. a) (7 points)
   Write a function `numI = QGL(fname)` that approximates the integral of a function from -1 to 1 by applying the 3-point Gauss-Legendre rule. Test your MATLAB function with $f(x) = \frac{1-e^{1-x^2}}{1-e}$.
   HINT: Assume that this Gauss-Legendre rule is symmetric, i.e.,$x_3 = -x_1$, $x_2 = 0$ and $w_1 = w_3$.

   b) (8 points)
   Write a function `numI = CompQGL(fname,n)` that approximates the integral of a function from -1 to 1 by applying the 3-point Gauss-Legendre rule on `n` equal-length subintervals. Test the MATLAB function with the same f as in part a) and `n`$= 10$.
   HINT: Use the appropriate translation formula on page 157 for each subinterval.

   c) (10 points)
   Compare the results above using 10 subintervals with the results obtained applyng the following to each subinterval:
   (i) left-point rule
   (ii) right-point rule
   (iii) mid-point rule
   (iv) trapezoidal rule
   (v) Simpson's rule

3. a) (5 points)
   Write a MATLAB subroutine `x = TriUSolve(U, b)` which computes the vector x, solution to the system $Ux = b$, where U is an upper triangular matrix.

   b) (2 points)
   Show the output for:

$$U = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 0 & 2 & 3 & 4 & 5 \\ 0 & 0 & 3 & 4 & 5 \\ 0 & 0 & 0 & 4 & 5 \\ 0 & 0 & 0 & 0 & \pi \end{bmatrix} \; b = \begin{bmatrix} -1 \\ -2 \\ -3 \\ -4 \\ -5 \end{bmatrix},$$

   c) (3 points)
   Show how many floating point operations are needed for solving a $n \times n$ system of this form.