CE 335 Practice Midterm

Open book and notes; 110'; use your own paper. Show your work! Problems have equal weight.

1] Write Matlab code that will plot, for x ranging from -4 to 4, the standard normal probability density $p(x) = (2\pi)^{-1/2} e^{-x^2/2}$.

2] Use Newton's method, starting with a reasonable initial guess, to find a positive number x such that $x^3 = x + 2$. Do up to 4 iterations, or you can stop when you estimate the absolute error in x to be less than 0.001.

3] Suppose **A** = [1 0; 0 -2] and **B** = [2 0; 1 0].

(a) Find **AB** and **BA**.

(b) Find **A**$^{-1}$ and **B**$^{-1}$.

4] Use Gaussian elimination with row pivoting to find the solution to the linear system [0 1 4; 2 5 4; 1 0 5] * **x** = [7; 5; 11]. Show the intermediate steps.

5] Aggregate for a construction project is to contain 1800 m³ sand, 2100 m³ fine gravel, and 2100 m³ coarse gravel. The three closest sources of material are determined to have the following compositions:

		% sand	% fine gravel	% coarse gravel
1	|	55	30	15
2	|	25	45	30
3	|	25	30	45

How much material should be obtained from each site to get the desired mixture?

(a) Express this problem as a system of linear equations.

(b) Solve using Gaussian elimination.

(c) Under what circumstances would LU decomposition be a more convenient way to solve this problem?

6] Estimate the integral of exp(-x²) between x = 0 and x = 1 using Simpson's rule with

(a) one subinterval,

(b) two subintervals.

(c) Assess your error based on the difference between the two results.

7] Explain in a couple sentences why `sin(pi)` in Matlab returns not zero but `1.2246e-16`.

8] (a) Use Euler's method with h = 0.25 to estimate y(t = 1) if dy/dt = y + t - t² and y(t = 0) = 1. (b) If you needed to know the answer to within 0.01, how could you determine if your result from part a is accurate enough?