MATH 206 HW#8

1) Find the Laplace transforms of the following using Matlab.

   a) $f(t) = t^3 + 2t^2 - t + 1$

   b) $f(t) = (t^2 + 2t - 1) \cdot e^{2t}$

2) a) First, find **<u>by hand</u>** the Laplace transform of the 2^{nd} order differential equation:

$$\frac{d^2}{dt^2} f(t) - \frac{d}{dt} f(t) - 2f(t) = \delta(t-1)$$

subject to initial conditions:

$$f^{(1)}(0) = 0 \qquad f(0) = 0$$

b) Find the solution using the command *ilaplace*(...) in MATLAB; i.e. inverse-Laplace transform the result of part a**.** Comment on the result.
Hint: Using the command *simple*(...) may help you on simplification of the result.

3) Use Rouche's Theorem to determine the number of roots of

$$4z^5 + 7z^2 - 1 = 0$$

inside the circle $|z| = \frac{1}{2}$ about the origin. Verify your results by finding the roots in MATLAB.
Hint: The statement of Rouche's Theorem is on page 231 (Theorem 2). To see how Rouche is used, see Example 2 on page 232. Also choose f(z) and g(z) accordingly, so that $|f(z)| > |g(z)|$ on the circle $|z| = \frac{1}{2}$.

4) Using MATLAB, evaluate the integral

$$\int_0^\infty \frac{\sin(x)}{x} dx$$

Then compare the computed result with the calculated result (Chp.7, Sec.63, pg.220)
Hint: The symbolic *inf* means ∞ in MATLAB.