Name_____ CM#_____

Section_____

# MA 222 Final Exam Part I 20 Feb. 2008

**Instructions:** Answer all questions in the space provided. Show work appropriate for methods used, and be neat. On this part of the final exam you may use only a pen or pencil and the Laplace Transform tables provided. Be sure to follow any specific instructions given in the questions.

**For Grading Use**

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| #2 | 10 | |
| #3 | 10 | |
| #4 | 10 | |
| #5 | 10 | |
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1.) Find the inverse Laplace transforms of the following functions:

a.) $\frac{s-1}{s^2+2s+10}$

b.) $\frac{s-1}{s^2+2s-3}$

c.) $\frac{e^{-2s}}{s^2+4s+4}$

2.) Solve the ODE IVP

$$x'' + 3x' + 2x = 3\delta(t),\ y(0) = 1, y'(0) = -1$$

using the method of Laplace transforms.

3.) Find the general solution of the system

$$x' = 4x + 2y$$
$$y' = 2y + 4x$$

then give the particular solution corresponding to the initial conditions $x(0) = 1, y(0) = 0$.

4.) Find all equilibrium points of

$$x' = x - xy$$
$$y' = y - 2xy$$

and classify as best you can their type and stability. Sketch the phase portrait.

5.) Find a power series solution of the ODE

$$y'' + x^2 y = 0$$

valid near $x = 0$.

6.) Consider the function

$$f(t) = \begin{cases} 1, 0 \leq t \leq .5 \\ -1, .5 < t \leq 1 \end{cases}.$$

a.) Sketch the graph of $f(t)$.
b.) Sketch the graph of the Fourier Sine Series of $f(t)$ on $-2 \leq t \leq 2$.
c.) Sketch the graph of the Fourier Cosine Series of $f(t)$ on $-2 \leq t \leq 2$.