

**Math 242, Exam 3, Spring 2012**

Write everything on the blank paper provided.

**You should KEEP this piece of paper.**

If possible: turn the problems in order (use as much paper as necessary), use only one side of each piece of paper, and leave 1 square inch in the upper left hand corner for the staple. If you forget some of these requests, don't worry about it – I will still grade your exam.

The exam is worth 50 points. There are 4 problems.

SHOW your work. *CIRCLE* your answer. Write **coherently**.

**No Calculators or Cell phones.**

1. (13 points) Find the Laplace transform of  $f(t) = \begin{cases} 0 & \text{if } 0 \leq t < 1 \\ t & \text{if } 1 \leq t. \end{cases}$
2. (13 points) Solve the Initial Value Problem  $y'' + 3y' + 2y = e^x$ ,  $y(0) = 0$ ,  $y'(0) = 3$ .
3. (12 points) Find the general solution of  $y'' - 6y' + 13y = 0$ .
4. (12 points) Suppose that a body moves through a resisting medium with resistance proportional to its velocity  $v(t)$ , so that  $\frac{dv}{dt} = -kv$ . Let  $x(t)$  be the position of the object at time  $t$ . Let  $v(0) = v_0$  and  $x(0) = x_0$ . Find the velocity and position of the object at time  $t$ . Find  $\lim_{t \rightarrow \infty} x(t)$ .