

MA 238: TEST 3 (12/6/04)

INSTRUCTIONS: Write your name on each answer sheet and show all your work on the problems.

1. Use the Laplace transform to solve the initial value problem

$$x'' + 8x' + 15x = 0, \quad x(0) = 2, \quad x'(0) = -3.$$

2. Use the Laplace transform to solve the initial value problem

$$y'' + y = t, \quad y(0) = 0, \quad y'(0) = 0.$$

3. (a) Find $L^{-1}\left\{\frac{3}{s^2 + 6s + 18}\right\}$.

(b) Use the Laplace transform and the convolution theorem to solve the initial value problem

$$x'' + 6x' + 18x = 3 \cos 2t, \quad x(0) = 1, \quad x'(0) = 0.$$

4. Use the Laplace transform and the convolution theorem to find a formula for the solution of the initial value problem

$$y'' + 9y = f(t), \quad y(0) = 2, \quad y'(0) = 1.$$

5. (a) Let $f(t) = -1$ if $t < 1$ and $f(t) = t$ if $t \geq 1$. Find $L\{f(t)\}$.

(b) Use the second translation theorem to find $L^{-1}\{F(s)\}$ where $F(s) = \frac{e^{-2s}}{s-1}$.