

MA 238-02: TEST 3 (4/17/09)

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

$$y'' - 2y' - 3y = 0, \quad y(0) = 2, \quad y'(0) = -3.$$

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

$$y'' + 4y' + 3y = 3, \quad y(0) = 0, \quad y'(0) = 0.$$

3. Find $L^{-1} \left[\frac{s}{s^2 + 2s + 5} \right]$.

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

$$y'' + y' - 6y = f(t), \quad y(0) = 0, \quad y'(0) = 0.$$

(b) Let $f(t) = e^{2t} \sin 5t$ in (a). Find $y(t)$.

(Hint: $\int e^{at} \sin bt \, dt = \frac{e^{at}}{a^2 + b^2} (a \sin bt - b \cos bt) + c$.)

5. (**Bonus**) (i) Find

$$L[t \sin(kt)].$$

(ii) Use (i) to find

$$L^{-1} \left[\frac{s}{(s^2 + 25)^2} \right].$$