

**Math. 2403, Practice Test3**

1. Solve the initial value problem

$$y'' - 2y' - 3y = 2\delta(t - 1), \quad y(0) = 2, \quad y'(0) = 6.$$

2. Solve the integral equation

$$y(t) + \int_0^t (t - \tau)^2 y(\tau) d\tau = t^3 + 3.$$

3. Find a general solution of

$$\mathbf{x}'(t) = \begin{pmatrix} 9 & 4 & 0 \\ -6 & -1 & 0 \\ 6 & 4 & 3 \end{pmatrix} \mathbf{x}(t).$$

4. Let

$$A = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}.$$

(a) Find  $e^{At}$ .

(c) Find the solution of

$$\mathbf{x}'(t) = A\mathbf{x}(t) + \begin{pmatrix} \sec t \\ 0 \end{pmatrix}, \quad \mathbf{x}(0) = \begin{pmatrix} 0 \\ 0 \end{pmatrix}.$$