Homework 15

Instructions: Complete each of the following on separate, stapled sheets of paper.

1. Solve the following linear systems of ODEs using Laplace transforms.

   (a) $\begin{cases} x'(t) &= -x(t) + y(t) \\ y'(t) &= 2x(t) \end{cases}$ subject to $x(0) = 0, \quad y(0) = 1.$

   (b) $\begin{cases} x''(t) + x(t) - y(t) &= 0 \\ y''(t) + y(t) - x(t) &= 0 \end{cases}$ subject to $x(0) = 0, \quad x'(0) = -2, \quad y(0) = 0, \quad y'(0) = 1.$

   (c) $\begin{cases} x''(t) + y''(t) &= t^2 \\ x''(t) - y''(t) &= 4t \end{cases}$ subject to $x(0) = 8, \quad x'(0) = 0, \quad y(0) = 0, \quad y'(0) = 0.$

   (d) $\begin{cases} x'(t) - 4x(t) + y'''(t) &= 6\sin(t) \\ x'(t) + 2x(t) - y'''(t) &= 0 \end{cases}$ subject to $x(0) = 0, \quad y(0) = 0, \quad y'(0) = 0, \quad y''(0) = 0.$

   (e) $\begin{cases} x'(t) &= 2y(t) + e^t \\ y'(t) &= 8x(t) - t \end{cases}$ subject to $x(0) = 1, \quad y(0) = 1.$

2. Solve the linear systems of ODEs above again, using the annihilator method.