Due Tuesday, April 25 at the beginning of class.
If you use convolutions, please write your answer in terms of convolution integrals.

1. Solve the initial value problem using the method of Laplace transform.
   (a) $y'' + 2y' + 2y = \delta(t - \pi)$, $y(0) = 1$, $y'(0) = 0$,
   (b) $y'' + 2y' + 3y = \sin t + \delta(t - 3\pi)$, $y(0) = y'(0) = 0$

2. Express the solution of the initial value problem
$$4y'' + 4y' + 17y = g(t), \qquad y(0) = y'(0) = 0$$
   in terms of a convolution integral.

3. Transform the given equation/initial value problem into a system of first order equations.
   (a) $y'' + 0.5y' + 2y = 3\sin t$
   (b) $y'' + 0.25y' + 4y = 2\cos 3t$, $y(0) = 1$, $y'(0) = -2$.

4. If $A = \begin{pmatrix} 1+i & -1+2i \\ 3+2i & 2-i \end{pmatrix}$ and $B = \begin{pmatrix} i & 3 \\ 2 & 2i \end{pmatrix}$, find
   (a) $3A - 2B$
   (b) AB
   (c) BA

5. If $A = \begin{pmatrix} 1 & 4 \\ -2 & 3 \end{pmatrix}$, find A^{-1}.

6. Find general solutions of the given system and sketch its phase portrait.
   (a) $\mathbf{x}' = \begin{pmatrix} 1 & -2 \\ 3 & -4 \end{pmatrix}\mathbf{x}$
   (b) $\mathbf{x}' = \begin{pmatrix} 2 & -5 \\ 1 & -2 \end{pmatrix}\mathbf{x}$