217 PROBLEM SET # 5 DUE 4/3 at 4:30

1. Use convolution to find $L^{-1}\{\frac{3}{s(s^2+9)}\}$.

2. Use convolution to find $L^{-1}\{\frac{3}{s^2(s^2+9)}\}$.

3. Find the Laplace transform of $h(t) = \int_0^t x^2 e^{t-x}\,dx$.

4. Use Laplace transforms to solve the I.V.P. $\vec{x}' = \begin{pmatrix} -1 & 1 \\ 1 & -1 \end{pmatrix}\vec{x} + \begin{pmatrix} 0 \\ 2 \end{pmatrix}$, $\vec{x}(0) = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$.

5. Same, for the I.V.P. $\vec{x}' = \begin{pmatrix} -4 & 6 \\ -3 & 5 \end{pmatrix}\vec{x}$, $\vec{x}(0) = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$.

6. Solve the equation $x'' - 3x' + 2x = 0$ by reducing it to a 2 by 2 system in x(t) and y(t) = x'(t). Check your answer using the usual method.

7. Let A, B and C be 2 by 2 matrices. Show that A(BC) = (AB)C.

8. Find the general solution of the system $\vec{x}' = \begin{pmatrix} 1 & 1 \\ 9 & 1 \end{pmatrix}\vec{x}$. Sketch enough trajectories near $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$ to show the nature of that critical point.

9. Solve $\vec{x}' = \begin{pmatrix} 1 & -5 \\ 1 & -3 \end{pmatrix}\vec{x}$, $x(0) = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$. What kind of curves are the trajectories?

10. Solve the system $\begin{cases} x' = -y \\ y' = x \end{cases}$, x(0) = 1, y(0) = 0

a) Using Laplace transforms
b) Using matrix methods.