Math 285 Name ____________________
Spring, 2009

Exam 3
Show some work!

1. Solve $y'' - 3y' + 2y = e^{-4t}, y(0) = 1, y'(0) = 5$ using Laplace transforms.

2. Solve $y'' + y = \sec x$ using variation of parameters.

3. Solve $y''' + y'' = e^x \cos x$.

4. Solve the given non-homogeneous system.

$$\begin{cases} x_1' = x_1 + 2x_2 + 5e^{4t} \\ x_2' = 2x_1 + x_2 \end{cases}$$

5. Determine whether the given matrix is diagonalizable. Where possible, find a matrix S such that $S^{-1}AS = diag(\lambda_1, \lambda_2, \cdots, \lambda_n)$.

$$\begin{bmatrix} 0 & -2 & -2 \\ -2 & 0 & -2 \\ -2 & -2 & 0 \end{bmatrix}$$

6. Determine the general solution to the system $\vec{x}' = A\vec{x}$ for the given matrix A.

$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 5 & -7 \\ 0 & 2 & -4 \end{bmatrix}$$

7. Determine the inverse Laplace transform of

$$F(s)=\frac{2s+3}{(s-1)(s^2+1)}$$

8. Let $T : R^4 \mapsto R^3$ be a linear transformation represented by

matrix $A = \begin{bmatrix} 1 & -1 & 0 & 2 \\ 0 & 1 & 2 & -3 \\ 1 & 0 & 2 & -1 \end{bmatrix}$. Find a basis for the $Ker(T)$ *and* $Rng(T)$.