Math 275 **Exam 3 Review**

1. Use the method of reduction of order to solve the differential equations.
   a. $\left(D^2+4\right)y=\csc 2x$
   b. $\left(D^2+9\right)y=9\sec^2 3x$
   c. $\left(D^2-4D+3\right)y=\dfrac{1}{1+e^{-x}}$

2. Use the method of variation of parameters to solve the differential equations.
   a. $\left(D^2+1\right)y=\sec^2 x$
   b. $\left(D^2-6D+9\right)y=\dfrac{e^{3x}}{x^2}$
   c. $\left(D^2-4\right)y=e^{-2x}\sin e^{-2x}+\cos e^{-2x}$

3. Write the given system as a matrix equation.
   $$\frac{dx}{dt}=\frac{dy}{dt}+3x$$
   $$\frac{d^2y}{dt^2}=-5x+3y$$

4. Find the general solution of each system.
   a. $X'=\begin{pmatrix}1 & -1\\ 2 & 4\end{pmatrix}X$
   b. $X'=\begin{pmatrix}1 & 0 & 0\\ 0 & 0 & 2\\ 0 & 2 & 0\end{pmatrix}X$
   c. $X'=\begin{pmatrix}2 & -4\\ 2 & -2\end{pmatrix}X$
   d. $X'=\begin{pmatrix}-1 & -2\\ 8 & -1\end{pmatrix}X$
   e. $X'=\begin{pmatrix}1 & -4\\ 4 & -7\end{pmatrix}X$
   f. $X'=\begin{pmatrix}1 & 0 & 0\\ -4 & 1 & 0\\ 3 & 6 & 2\end{pmatrix}X$
   g. $X'=\begin{pmatrix}0 & 1 & 1\\ 1 & 0 & 1\\ 1 & 1 & 0\end{pmatrix}X$