

DIFFERENTIAL EQUATIONS

REVIEW PROBLEMS FOR EXAM II

Find the general solution of the given system of equations:

$$1. \mathbf{x}' = \begin{bmatrix} 3 & -2 \\ 2 & -2 \end{bmatrix} \mathbf{x} \quad 2. \mathbf{x}' = \begin{bmatrix} 1 & -2 \\ 3 & -4 \end{bmatrix} \mathbf{x}$$

$$3. \mathbf{x}' = \begin{bmatrix} 2 & -1 \\ 3 & -2 \end{bmatrix} \mathbf{x} \quad 4. \mathbf{x}' = \begin{bmatrix} 1 & 1 \\ 4 & -2 \end{bmatrix} \mathbf{x}$$

$$5. \mathbf{x}' = \begin{bmatrix} 3 & -2 \\ 4 & -1 \end{bmatrix} \mathbf{x} \quad 6. \mathbf{x}' = \begin{bmatrix} -1 & -4 \\ 1 & -1 \end{bmatrix} \mathbf{x}$$

$$7. \mathbf{x}' = \begin{bmatrix} 2 & -5 \\ 1 & -2 \end{bmatrix} \mathbf{x} \quad 8. \mathbf{x}' = \begin{bmatrix} 1 & -1 \\ 5 & -3 \end{bmatrix} \mathbf{x}$$

$$9. \mathbf{x}' = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix} \mathbf{x} \quad 10. \mathbf{x}' = \begin{bmatrix} 4 & -2 \\ 8 & -4 \end{bmatrix} \mathbf{x}$$

Find the general solution of the given differential equation using the method of undetermined coefficients

$$1. y'' - 2y' - 3y = 3e^{2t}$$

$$2. y'' + 2y' + 5y = 3 \sin 2t$$

$$3. y'' + 2y' = 3 + 4 \sin 2t$$

$$4. y'' - y' - 2y = \cosh 2t \quad \text{Hint: } \cosh t = (e^t + e^{-t})/2$$

Find the general solution of the given differential equation by variation of constants

$$1. y'' + y = \tan t$$

$$2. y'' + 4y' + 4y = t^{-2}e^{-2t}$$

Use reduction of order to find the general solution of each ODE

$$y'' + 6y' + 8y = t^2e^{-2t}$$

$$ty'' - [t \tan t + 1]y' + [tant - t \sec^2 t]y = 0 \quad y_1 = \sec t$$