

MATH2214 - Quiz 4 - Fall 03 - Konaté

**Problem 1 (10 points)**

Transform the given differential equation into an equivalent system of first-order differential equation

$$(1) y'' + 3y' + 7y = t^2 \quad (2) y^{(4)} + 6y'' - 3y' + y = \cos(3t)$$
$$(3) t^2 y'' + ty' + (t^2 - 1)y = 0 \quad (4) t^3 y^{(3)} - 2t^2 y'' + 3ty' + 5y = \text{Ln}(t)$$

**Problem 2 (30 points)**

Find the general solution to the system of differential equation where

$$(1) \begin{cases} x_1' = x_1 - 2x_2 \\ x_2' = 2x_1 - 3x_2 \end{cases}$$

and

$$(2) X' = \begin{pmatrix} 1 & 1 & 1 \\ 2 & 1 & -1 \\ 0 & -1 & 1 \end{pmatrix} X$$

**Problem 3 (30 points)**

Solve the Initial value system of differential equation

$$(1) X' = \begin{pmatrix} 4 & -3 \\ 3 & 4 \end{pmatrix} X; \quad X(0) = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

and

$$(2) X' = \begin{pmatrix} 0 & 0 & -1 \\ 2 & 0 & 0 \\ -1 & 2 & 4 \end{pmatrix} X; \quad X(0) = \begin{pmatrix} 7 \\ 5 \\ 5 \end{pmatrix}$$

**Problem 4 (30 points)**

Solve the Initial value system of differential equation

$$(1) X' = \begin{pmatrix} 3 & 9 \\ -1 & 3 \end{pmatrix} X; \quad X(0) = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$$

and

$$(2) X' = \begin{pmatrix} 1 & 0 & 0 \\ -4 & 1 & 0 \\ 3 & 6 & 2 \end{pmatrix} X; \quad X(0) = \begin{pmatrix} -1 \\ 2 \\ -30 \end{pmatrix}$$

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