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1. Solve the ODE (initial problem) (20%) Created by Unregistered Version

$$y'' - 4y = 0 \quad y(0) = 1, y'(0) = 2$$

2. Solve the non-homogeneous ODE (20%)

$$xy'' + 2y' = 1$$

(a) Find $y_h = ?$

(b) Find y_p (particular solution) and general solution ($y = y_h + y_p$)

3. Using the Gauss elimination solve the system (x_1, x_2, x_3, x_4) (15%)

$$\begin{bmatrix} 1 & 1 & 1 & -2 \\ 1 & -2 & 1 & 4 \\ 2 & 0 & -3 & 1 \\ -2 & 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 8 \\ -4 \\ -8 \\ 2 \end{bmatrix}$$

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4. 對於同階方陣 A 、 B 、 C 而言，下列何者不正確，並請將錯誤的改正(15%)

(a) $(A+B)C = CA + CB$

(b) $(ABC)^T = A^T B^T C^T$

(c) $(A+B+C)^T = C^T + B^T + A^T$

(d) $|AB| = |BA| = |A||B|$

(e) $(A+B)^2 = A^2 + 2AB + B^2$

(f) $(kA)^T = k^T A^T$ k 純量

(g) $AB \neq BA$

(f) $AB = AC \Rightarrow B = C$

5. For the matrix A

$$A = \begin{bmatrix} 2 & 1 & 2 \\ 0 & 1 & 0 \\ 2 & 2 & -1 \end{bmatrix}$$

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Find the inverse matrix (反矩陣) A^{-1} . (15%)

6. Using the convolution theorem and Laplace transform solve the equation. (15%)

$$y(t) = te^t - 2e^t \int_0^t e^{-x} y(x) dx$$