

國立中央大學九十學年度轉學生入學試題

地球科學系 三年級

科目： 應用數學

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(20%) 1. Find the **inverse matrix** of the following matrixes.

$$(1) \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$$

$$(2) \begin{bmatrix} 0 & 2 & 0 \\ 4 & 0 & 0 \\ 0 & 0 & 5 \end{bmatrix}$$

(20%) 2. Use **Fourier series** to express the following functions.

$$(1) f(x) = x^2 \quad (0 < x < 2\pi)$$

$$(2) f(x) = \begin{cases} -1 & \text{if } 0 < x < \frac{\pi}{2} \\ 0 & \text{if } \frac{\pi}{2} < x < 2\pi \end{cases}$$

(20%) 3. Use Taylor expansion to find the Taylor series of the function

$$f(z) = \frac{1}{z} \text{ at point } z = 1.$$

(20%) 4. Solve the following **initial value problems**.

$$(1) y' + ky = e^{-bx}, \quad y(0) = 0.7$$

$$(2) y' + x^3 y = 4x^3, \quad y(0) = -1$$

(20%) 5. Find the **unit vector A** that is perpendicular to $U = 2\hat{i} + \hat{j} - \hat{k}$ and

$$V = \hat{i} - \hat{j} + \hat{k}$$

參考用