

口述試験(午前1)
工学基礎

24 大修

時間 9:00~10:00

注意事項

1. 問題は全部で3題ある。この全てについて解答せよ。
2. 答案用紙は全部で3枚ある。
3. 各答案用紙には、必ず受験番号を記入せよ。
4. 計算機能のみの電卓を使用してもよい。

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Answers to questions can be given in Japanese or English.

1. Obtain the general solution of the ordinary differential equation,

$$x \frac{d^2 y}{dx^2} - \frac{dy}{dx} - 4x^3 y = 0, \quad (1)$$

by assuming a solution in the form of a *power series* (べき級数) with unknown coefficients a_m ,

$$y = \sum_{m=0}^{\infty} a_m x^m, \quad (2)$$

and give the first six non-zero terms of the power series.

2. Find the eigenvalues (固有値) and normalized eigenvectors (正規化された固有ベクトル) of the matrix,

$$\mathbf{A} = \begin{bmatrix} 1 & -3 & \sqrt{2} \\ -3 & 1 & -\sqrt{2} \\ \sqrt{2} & -\sqrt{2} & 4 \end{bmatrix}. \quad (3)$$

A normalized vector means a unit vector.

3. A simple curve C is represented parametrically by $\mathbf{r}(t) = 5 \cos t \mathbf{i} + 5 \sin t \mathbf{j}$. Find the tangent vector (接線ベクトル) and unit tangent vector (単位接線ベクトル) to curve C . Find the parametric representation of the straight line which is tangent to the curve C at $P:(4,3)$. Here $(4,3)$ are the x, y coordinates of point P . Unit vectors \mathbf{i}, \mathbf{j} are in the direction of the x -axis and y -axis, respectively.