口 述 試 験（午 前 1）　　　２５　大修
工 学 基 礎　　　　　　　　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。

Answers to questions can be given in Japanese or English.

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

$$\frac{d^2 y}{dx^2} - 3\frac{dy}{dx} + 2y = 0, \tag{1}$$

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

$$y = \sum_{m=0}^{\infty} a_m x^m, \tag{2}$$

and give the first five 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,

$$\mathbf{A} = \begin{bmatrix} 3 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix}. \tag{3}$$

A normalized eigenvector means an eigenvector whose magnitude (大きさ) is one.

3. A simple curve C is represented parametrically by $\mathbf{r}(t) = t\,\mathbf{i} + t^3\,\mathbf{j}$. 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 $P:(1,1)$. Here $(1,1)$ 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.