

Answers to questions can be given in Japanese or English.

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

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

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

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

2. Find the eigenvalues (固有値) and eigenvectors (固有ベクトル) of the matrix,

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

3. Evaluate the line integral $\oint_C [(y - \sin x)dx + \cos x dy]$ where C is the triangle shown in Fig.1. The positive direction in traversing C is from $(0,0)$ to $(\pi/2,0)$ along OA, from $(\pi/2,0)$ to $(\pi/2,1)$ along AB and from $(\pi/2,1)$ to $(0,0)$ along BO.

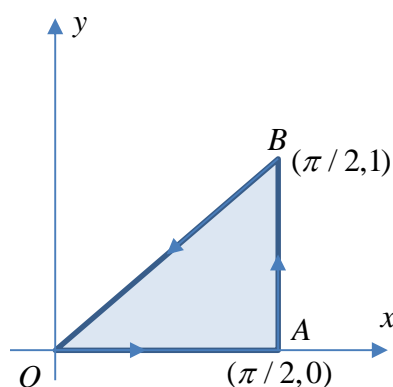


Fig.1.