1. To give the general solution for the differential equation： (10%)

$$xy' - 5y = 2x^4$$

2. To give the general solution for the differential equation： (10%)

$$(x + 3)y'' - (2x + 3)y' + (x+1)y = 0$$

3. To solve the following initial value differential equation： (15%)

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

4. To solve the following initial value differential equation： (15%)

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

5. To give the general solution for the differential equation： (15%)

$$y'' - 2y = 3\sin(x) \qquad y_p = -\sin(x) \qquad \text{(p: particular)}$$

6. To find the solution for the following linear system (equations)： (15%)

$$\begin{cases} x_1 + 3x_2 + x_3 + 3x_4 = 1 \\ 2x_1 + 2x_2 + 2x_3 + 3x_4 = 2 \\ 2x_1 + 5x_2 + 2x_3 + x_4 = 1 \\ x_1 + 3x_3 + 2x_4 = 3 \end{cases}$$

7. To find the Fourier transform for the following function： (20%)

$$F(x) = -\pi/3, \qquad 0 < x < \pi,$$
$$F(x) = \pi/3, \qquad \pi < x < 2\pi, \quad \text{and}$$
$$F(x) = F(x + 2\pi)$$