●不可使用電子計算機

1. Please solve the following **ordinary differential equations**.

    (a) $y'' + 9y = \csc 3x$ (15%)

    (b) $y'' + 3y' - 4y = 6e^{2t-2}$, $y(1) = 4$, $y'(1) = 5$ (15%)

    (c) $\begin{cases} y_1' = -6y_1 + 4y_2 , \ y_1(0) = -2 \\ y_2' = -4y_1 + 4y_2 , \ y_2(0) = -7 \end{cases}$ (15%)

2. Evaluate the integral by the **divergence theorem**. (10%)

    $\overline{F} = [\sin y, \ \cos x, \ \cos z]$

    S : the surface of $x^2 + y^2 \le 4$, $|z| \le 2$

3. Check for path independence and, if independent, integrate from

    (0, 0, 0) to (a, b, c)

    $(ze^x - e^y)dx - xe^y dy + e^x dz$ (15%)

4. Please find the **Fourier series** of the given function $f(x)$. (15%)

    $f(x) = x^2$, if $-\dfrac{\pi}{2} < x < \dfrac{\pi}{2}$

5. Please find the **Fourier transform** of $f(x)$. (15%)

    $f(x) = \begin{cases} e^x, & if -a < x < a \\ 0, & \text{otherwise} \end{cases}$