# 淡江大學九十四學年度轉學生招生考試試題

系別： 物理學系三年級　　科目：應 用 數 學

| 准帶項目請打「V」 | |
|---|---|
| X | 簡單型計算機 |

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1. (a) Given $\vec{A} = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$, ***calculate directly*** $\int \vec{A} \cdot d\vec{\sigma}$ over the whole surface of the cube with four of its vertices at (0, 0, 0), (0, 0, 1), (0, 1, 0) and (1, 0, 0). (10 points)

   (b) Evaluate the same integral by using of the divergence theorem. (10 points)

2. Given $A = \begin{pmatrix} -3 & 2 & 2 \\ 2 & 1 & 3 \\ 2 & 3 & 1 \end{pmatrix}$ find its eigenvalues and eigenvectors. Are these eigenvectors orthogonal to each other? (20 points)

3. Solve the following differential equation. (20 point)

$$x^2 y'' + xy' - 4y = x^3$$

4. Given $f(x) = 1, -\frac{\pi}{2} < x < \frac{\pi}{2}; 0, \frac{\pi}{2} < x < \frac{3\pi}{2}$, $f(x + 2\pi) = f(x)$. Expand $f(x)$ in Fourier series and show $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots\ldots\ldots = \frac{\pi}{4}$. (20 points)

5. Evaluate $I = \int_0^{\pi} \frac{d\theta}{(a + \cos\theta)^2}$, where $a > 1$. (20 points)