

淡江大學八十八學年度碩士班招生考試試題

系別：物理學系

科目：物理數學

本試題共 1 頁

1. Find the differential equation that the function $y(x)$ must be satisfied such that the integral

$$\int_a^b F(y, \frac{dy}{dx}, x) dx \quad (20\%)$$

has a stationary value for small variation of $y(x)$.

2. Prove the parseval's theorem for the function $f(x)$ and its Fourier transform, namely

$$\int_{-\infty}^{\infty} |f(x)|^2 dx = \frac{1}{2\pi} \int_{-\infty}^{\infty} |g(y)|^2 dy$$

where $g(y) = \int_{-\infty}^{\infty} f(x) e^{-ixy} dx$ (20%)

3. Solve the differential equation

$$xy' + y = e^x \quad (20\%)$$

4. Evaluate the integral

$$\int_a^b f(x) \delta[g(x)] dx \quad (20\%)$$

where $g(x) = 0$ has two roots x_1, x_2 in the interval $a < x < b$, and $\delta(x)$ is the Dirac δ -function.

5. Find the eigenvalues and the corresponding eigenvector of the matrix

$$A = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix} \quad (20\%)$$