

# 淡江大學九十二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「○」否則打「×」	
×	簡單型計算機

本試題共 / 頁

1. Consider the conic  $5x^2 - 4xy + 2y^2 = 30$ , find the principal axes of the conic and express the conic in the principal axes. (10 points)

2. Suppose that displacement as a function of time for a moving particle is  $\vec{r}(t) = t^2\hat{i} - 2t\hat{j} + (t^2 + 2t)\hat{k}$ , find the equations of the line tangent to the curve described by the particle and the plane normal to this curve at  $(4, -4, 8)$ . (15 points)

3. Use the method of contour integration to evaluate the integral  $I = \int_{-\infty}^{\infty} \frac{\sin^3 x}{x^3} dx$ . (15 points)

4. Solve the following differential equation (15 points)

$$x^2 y'' - 2xy' + 2y = x \ln x.$$

5. Given  $f(x) = \sin x$ ,  $0 < x < \pi$ , expand  $f(x)$  in Fourier cosine series. (15 points)

6. Given  $\vec{A} = z\hat{i} + x\hat{j} - 3y^2z\hat{k}$ , find  $\iint_S \vec{A} \cdot \hat{n} d\sigma = ?$  Where S is the surface bounded by  $z = 0$ ,  $z = 5$ , and  $x^2 + y^2 = 16$  in the 1<sup>st</sup> quadrant. (15 points)

7. Solve the following partial differential equation with given boundary conditions. (15 points)

$$\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2} + x, 0 \leq x \leq 1, t > 0.$$

$$B.C. u(0, t) = u(1, t) = 0,$$

$$I.C. u(x, 0) = \frac{x^3}{6}, \frac{\partial u(x, 0)}{\partial t} = 0$$