國立彰化師範大學 102 學年度碩士班招生考試試題

系所：光電科技研究所　　科目：工程數學

☆☆請在答案紙上作答☆☆　　

1. Solve the initial value problem : $y' + y\tan x = \sin 2x,\ y(0) = 1$.(10%)

2. Find $f(t)$ if the Laplace Transforms $L(f)$ equals : (20%)

   (a) $\dfrac{e^{-2s}}{s^6}$　　(b) $\arctan\dfrac{s}{e}$

3. Using the Fourier transform of $f(x) = \dfrac{\pi}{2}e^{-x}$ if $x > 0$, calculate $\int_0^\infty \dfrac{\cos\omega x}{1+x^2}dx$. (20%)

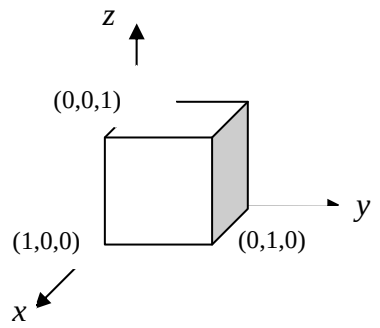
4. Solve the Laplace equation inside the unit cubic box

   $\nabla^2\Phi(x, y, z) = 0, \quad 0 \le x, y, z \le 1$

   with the boundary conditions: $\Phi(0, y, z) = 0$, $\Phi(1, y, z) = 0$,

   $\Phi(x,0, z) = 0$, $\Phi(x, 1, z) = 0$, $\Phi(x, y, 0) = 0$, and $\Phi(x, y, 1) = V_0$.

   (20%)



5. Consider the matrix

$$M = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & i \\ 0 & -i & 0 \end{pmatrix}$$

   (a) Find the eigenvalues and eigenvectors of the matrix M.

   (b) Evaluate M^{100}.

   (20%)

6. Evaluate the integral $\int_{-\infty}^{\infty} \dfrac{e^{ax}}{e^x + 1}dx, \quad 0 < a < 1$ (10%)