注意事項：

1. 本試題共十題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一. Solve the initial value problem $y' = \dfrac{x}{y}; y(4) = -2$. (10%)

二. Find the general solution of the equation $y' = \dfrac{2(2-y^3)}{3xy^2}$. (10%)

三. Solve the initial value problem $y'' - 2y' + 5y = 0; y(-4) = 1, y'(-4) = 3$. (10%)

四. Find the general solution of the equation $y'' + y = \dfrac{1}{\cos(x)}$. (10%)

五. Find the inverse Laplace transform of the function $\dfrac{1}{(s^2+1)^2}$. (10%)

六. If the Laplace transform of the function $f(t)$ is $\dfrac{1}{s(1+e^{-2s})}$, find $f(1)$ and $f(3)$.

(10%)

七. Find the condition when the system $\begin{array}{l} ax+by=c \\ dx+ey=f \\ gx+hy=i \end{array}$ has a unique solution for the

unknowns x and y. (10%)

八. Find the inverse of the matrix $\begin{pmatrix} 1 & 1 & -1 & 1 \\ 1 & 1 & 1 & -1 \\ 1 & -1 & 1 & 1 \\ 1 & -1 & -1 & -1 \end{pmatrix}$. (10%) Notice that the row

vectors are mutually orthogonal.

九. Find the determinant of the matrix $\begin{pmatrix} 1 & 1 & -1 & 1 \\ 1 & 1 & 1 & -1 \\ 1 & -1 & 1 & 1 \\ 1 & -1 & -1 & -1 \end{pmatrix}$. (10%)

十. If $x^2+y^2+z^2+w^2=5$, find the maximum of $x+2y+3z+4w$. (10%)