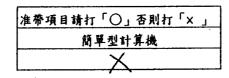
淡江大學九十三學年度碩士班招生考試試題

系別: 化學工程與材料工程學系 科目: 工程數學



本試題共 /

Problem One (20 %)

Solve the following system of differential equations.

$$\begin{pmatrix} x_1' \\ x_2' \end{pmatrix} = \begin{pmatrix} 0 & 8 \\ 2 & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + \begin{pmatrix} e^{3t} \\ t \end{pmatrix}$$

Hint:
$$\int ue^{au}du = \frac{au - 1}{a^2}e^{au} + C$$

Problem Two (20 %)

Solve the following partial differential equation.

$$\frac{\partial U}{\partial t} = 3 \frac{\partial^2 U}{\partial x^2}$$

I.C.
$$U(x, 0) = 1$$

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

Problem Three (20 %)

Solve the following differential equation.

$$y'' + y = \tan(x)$$
Hint: $\int \sec(x) dx = \ln|\sec(x) + \tan(x)| + C$

Problem Four (20 %)

Find the inverse of the following matrix.

$$\begin{pmatrix}
-1 & 1 & 16 & 2 \\
0 & 0 & 1 & 4 \\
0 & 0 & 1 & 6 \\
0 & 1 & 1 & -3
\end{pmatrix}$$

Problem Five (20 %)

Find the first three terms in a power series expansion about x = 0 for a general solution to the following differential equation.

$$x^2y'' + \frac{x}{2}y' + 2x^2y = 0$$