

國立臺灣科技大學

九十一學年度碩士班招生考試試題

系所組別：纖維及高分子工程系丙組

科目：工程數學

總分 100

Solve the following differential equations:

一. $\frac{dy}{dx} = \frac{e^x \sin y}{y - 2e^x \cos y}$ (14%)

二. $y'' - 2y' + y = \frac{2e^x}{x}$ (12%)

三. $y'' - y = \int_0^t \sinh \tau y(t - \tau) d\tau$ $y(0) = 1$ $y'(0) = 0$ (14%)

四. $y' + 4y + 5 \int_0^t y(\tau) d\tau = 5u(t)$ $y(0) = 1$ (10%)

where $u(t)$ is a unit step function.

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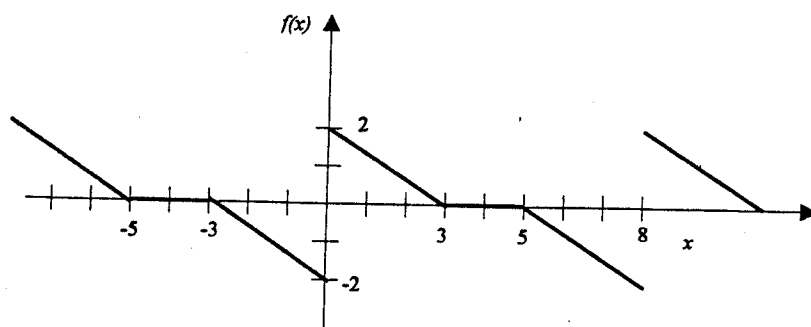
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2. Find (15 %)

$$\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}^{100} = ?$$

六. Solve the following problems. (20 %)

- (a) Find a unit normal vector $\mathbf{n}$ of the cone of $z^2 = 4(x^2 + y^2)$ at the point $P: (1, 0, 2)$.
- (b) Find the directional derivative of $f(x, y, z) = 2x^2 + 3y^2 + z^2$ at the point $P: (2, 1, 3)$ in the direction of the vector $\mathbf{a} = \mathbf{i} - 2\mathbf{k}$.

七. Find the Fourier series of the periodic function $f(x)$. (15 %)

Figure

