〈10分〉(1) Solve $y(t) = t + \int_0^t y(\tau)\sin(t-\tau)\,d\tau$

〈10分〉(2) if Fourier Transfoam of $f(t)$ is dcfinded as

$$\hat{f}(w) = \int_{-w}^{w} f(t)e^{-iwt}\,dt$$

Find the Fourier Transfoam of

$$f(t) = \begin{cases} (1-\frac{|t|}{T})\frac{1}{T} & ,|t|<T \\ 0 & ,|t|>T \end{cases}$$

(25分)(3) Find the eigenvalues and eigenfunctions of the following Boundary value Problem

$$\begin{cases} y''+\lambda y = 0 & ,0\le x\le h \\ y' = 0 & ,\ x=0 \\ y'-ay=0 & ,\ x=h \end{cases}$$

where a is a positive constant. Then

Find the eigenfunction expansion of 1.

(5分)(4) Find $\oint_C \vec{F}\cdot d\vec{r}$

where $\vec{F} = (y^2-7y)\vec{i} + (2xy+2x)\vec{j}$

C = unit cincle : $x^2+y^2=1$

(背面仍有題目.請繼續作答)

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(20分)(5) Solve the following boundary-value problem

$$\begin{cases} \dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0, & 0 \le x \le 1,\ 0 \le y \le 1 \\ u(x,0) = 1 \\ u(1,y) = 0 \\ u(x,1) = 0 \\ u(0,y) = 1 \end{cases}$$

(10分) (6) Evaluate $\displaystyle\int_0^{2\pi} \frac{d\theta}{\sqrt{2} - \cos\theta}$

(10分) (7) Evaluate $\displaystyle\int_0^{\infty} \frac{dx}{1+x^4}$

(10分) (8) Evaluate $\displaystyle\int_{-\infty}^{\infty} \frac{\sin \pi x}{x - x^5}\, dx$