※ 考生請注意：本試題 ☑可 □不可 使用計算機

(10%) 1. Find the solution of $y'' + 4y = 16\cos 2x$, $y(0) = 0$, $y'(0) = 0$

(15%) 2. Solve $y(t) + \int_0^t (t - \tau)y(\tau)\,d\tau = 1$ by Laplace transform.

(10%) 3. Transform the quadratic form $1.09x_1^2 - 0.06x_1 x_2 + 1.01x_2^2 = 1$ to canonical form.

(10%) 4. Find the angle between the planes $4x + 3y - z = 2$ and $x + y + z = 1$

(10%) 5. Evaluate the integral $\iint_S \mathbf{F} \cdot \mathbf{n}\,dA$ by the divergence theorem, where $\mathbf{F} = \begin{bmatrix} 5x^3, & 5y^3, & 5z^3 \end{bmatrix}$, S: $x^2 + y^2 + z^2 = 4$, $\mathbf{n}$: the outer unit normal vector.

(15%) 6. Find the Fourier cosine transform of $f(x) = e^{-2x}$ if $x > 0$, $f(x) = 0$ if $x < 0$.

(10%) 7. Find all solutions of the equation $\cosh z = 0$ in the complex plane.

(10%) 8. Evaluate the integral $\oint_C \tan \pi z\,dz$ in the complex plane, C: $|z| = 1$ (counterclockwise).

(10%) 9. Find the Cauchy principal value of the integral $\int_{\infty}^{\infty} \dfrac{dx}{x^4 - 1}$.