

國立臺灣海洋大學一〇二學年度研究所碩士班暨碩士在職專班招生考試試題

考試科目： 工程數學

系所名稱： 光電科學研究所碩士班不分組

※可使用計算器

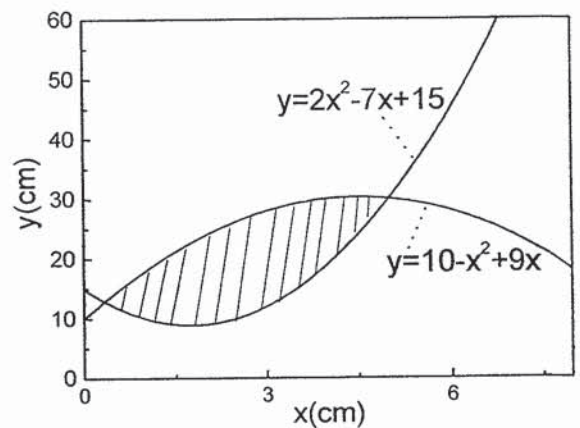
1.答案以橫式由左至右書寫。2.請依題號順序作答。

1. (10%) Assume that $\frac{d^2}{dt^2}x(t) = a$, $x(0) = x_0$, and $x(2) = 3$, where a and x_0 are constants. Solve $x(t)$ in terms of x_0, a , and t .

2. (12%) Solve the general solution of the following differential equation:

$$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = 3y + 4e^{2x}.$$

3. (12%) See the figure on the right side. Please calculate the area (in cm^2) of the marked region formed by intersection of the two parabolic curves indicated in the figure. Be sure to round off the answer to 2nd decimal places.



4. (10%) Please find the eigenvalues and eigenvectors of the matrix

$$A = \begin{bmatrix} 5 & 4 & 2 \\ 4 & 5 & 2 \\ 2 & 2 & 2 \end{bmatrix}$$

5. (10%) Prove that $(3, 3, 7)$ is a linear combination of $(1, 1, 0)$, $(0, 1, 1)$ and $(1, 0, 1)$.

6. (13%) Let $\mathbf{u} = (1, 2, 2)$, $\mathbf{v} = (2, 3, 1)$ be vectors of \mathbb{R}^3 .

(a) (3%) Determine the dot product of \mathbf{u} and \mathbf{v} .

(b) (3%) Find the norm of \mathbf{u} .

(c) (3%) Find the normalized vector of \mathbf{u} .

(d) (4%) Determine the cosine of the angle between \mathbf{u} and \mathbf{v} .

7. (12%) 請求出 $(1+i)^{1/4}$ 。

8. (8%) $z=x+iy$, 求 z^3 的實部與虛部。

9. (13%) 請計算積分 $\int_0^{\infty} \frac{x^2 + 1}{x^6 + 1} dx$ 。