

國立中山大學100學年度碩士班招生考試試題

科目：微積分【海資系碩士班丙組選考】

請詳細回答下列問題。

1. (a) Find an equation of the line tangent to the graph of $f(x) = 2x^2 - 2x + 4$ at the point $(0, 4)$. [10%]
(b) Find the relative extreme values of $f(x) = \frac{x^2+1}{x}$. [10%]
2. (a) Evaluate $\int_0^1 (3x+2)^9 dx$. [10%]
(b) Evaluate the integral $\int \frac{1}{e^x+e^{-x}} dx$. [10%]
3. (a) Evaluate the integral $\int \frac{2x^2}{x^2-1} dx$. [10%]
(b) Evaluate the integral $\int_0^\infty t^2 e^{-st} dt$ for $s > 0$. [10%]
4. (a) Let $f(x, y) = e^{x^2y} + x \ln y$. Find all first-order and second-order partial derivatives. [10%]
(b) Find all critical points for $f(x, y) = x^2 - y^2 + 2x + 6y + 2$ and determine whether each corresponds to a relative maximum, a relative minimum, or a saddle point. [10%]
5. (a) Let $R = \{(x, y) | 0 \leq x \leq 2, 1 \leq y \leq 3\}$. Evaluate the double integral $\iint_R (x + x^2y) dA$. [10%]
(b) Let $R = \{(x, y) | 0 \leq x \leq 2, x^2 + y^2 \leq 4\}$. Evaluate the double integral $\iint_R xy dA$. [10%]