

招生學年度	100	招生類別	碩士班
系所班別	應用數學系碩士班		
科目	微積分		
注意事項	本考科禁止使用掌上型計算機		

- (10 %) Find $\lim_{x \rightarrow \infty} (e^{2x} + 1)^{\frac{1}{x}}$.
- (10 %) Find an equation of the tangent line to the graph of the equation

$$1 + \ln xy = e^{x-y} \text{ at the given point } (1, 1).$$

- (10 %) If $f(x) = \int_2^x \frac{1}{\sqrt{1+t^4}} dt$, find $(f^{-1})'(0)$.
- (10 %) Find $\int_1^5 \frac{x}{\sqrt{2x-1}} dx$.
- (10 %) Find $\int_e^{e^2} \frac{1}{x \ln x} dx$.
- (10 %) Find $\int_0^c \ln x dx$.
- Show that
 - (5 %) $f_x(0, 0)$ exists and
 - (5 %) f is not differentiable at $(0, 0)$, where f is defined as

$$f(x, y) = \begin{cases} \frac{3x^2y}{x^4+y^2}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0). \end{cases}$$

- (10 %) Find the extreme values of $f(x, y) = x^2 + 2y^2 - 2x + 3$ subject to the constraint $x^2 + y^2 \leq 10$.
- (10 %) Evaluate

$$\int_0^1 \int_{\frac{y}{2}}^{\frac{1}{2}} e^{-x^2} dx dy$$

- (10 %) Evaluate

$$\int_R \int 3xy dA,$$

where R is the region bounded by the lines $x - 2y = 0$, $x - 2y = -4$, $x + y = 4$, and $x + y = 1$.