

東吳大學 108 學年度暑假轉學生招生考試試題

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系級	經濟學系二年級	考試時間	100 分鐘
科目	微積分	本科總分	100 分

請詳述計算過程與理由，僅寫答案者不予計分

1. (10%) Evaluate the derivative of the function

$$f(x) = \frac{e^{\sin(\ln x)}}{x^2}.$$

2. (10%) Evaluate $\lim_{x \rightarrow \infty} \left(1 + \frac{3}{x^2}\right)^{x^2+1}$.

3. Define the function $f(x) = e^{-\frac{(x-1)^2}{2}}$. Find the maximum value and inflection points of f . (10%)

4. (10%) Find a function f and a **positive number** a such that

$$4 - x^2 + \int_a^x \frac{f(t)}{\sec t} dt = 0, \text{ for } x > a.$$

5. (10%) Evaluate the indefinite integral

$$\int \frac{e^x}{(e^x + 1)^3} dx.$$

6. (10%) Evaluate the definite integral

$$\int_0^1 2x^3 e^{x^2} dx.$$

7. (10%) Find the interval of convergence of the series

$$\sum_{n=1}^{\infty} \frac{(x-2)^n}{3n}.$$

8. (10%) Find the extreme values of f on the region

$$f(x,y) = e^{-xy}, \quad 2x^2 + y^2 \leq 4.$$

9. (10%) Compute the double integral

$$\int_0^2 \int_0^y x^2 y dx dy.$$

10. (10%) Evaluate $\int_S (2x^2 + 3y) dA$, where S is the region in the plane bounded by the circles

$$x^2 + y^2 = 4 \text{ and } x^2 + y^2 = 9.$$