

東吳大學 112 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

※一律作答於答案卷上(題上作答不予計分)；並務必標明題號，依序作答。

1. Find $f'(x)$ for each $f(x)$.

(a) $f(x) = 3x^{2\pi} - 2x^{\sqrt{3}} + 2345 + \frac{3}{\sqrt[3]{x^4}}$ (5%) (b) $f(x) = \frac{\sin x - 2\cos x}{x+1}$ (5%)

(c) $f(x) = [e^{x^3-2x+7} - \ln(3x^4 + 12x^2 - 101)]^{100}$ (5%)

2. If $x^2 + 2xy + 4y^2 = 12$, find $\frac{d^2y}{dx^2} \Big|_{(x,y)=(2,1)}$. (5%)

3. Compute the following integrals.

(a) $\int \frac{e^x}{e^x - e^{-x}} dx$ (5%) (b) $\int \frac{17}{(x+7)(3x-4)} dx$ (5%) (c) $\int_e^\infty \frac{1}{x \cdot (\ln x)^3} dx$ (5%)

4. Find $\int x^2 \cdot (\ln x) dx$. (10%)

5. Evaluate the following double integrals.

(a) $\int_0^2 \int_y^{2+\sqrt{4-y^2}} 2 dx dy$ (10%) (b) $\int_0^8 \int_{\sqrt[3]{y}}^2 e^{x^4} dx dy$ (10%)

6. Find the tangent plane of $z = \ln(x+y^2) + y \cdot e^{xy}$ at the point $(x, y, z) = (0, 1, 1)$. (5%)

7. Find the absolute maximum value and minimum values of

$$f(x, y) = x^2 + y^2 + x^2y + 4$$

on the set $D = \{ (x, y) : |x| \leq 2, |y| \leq 1 \}$. (10%)

8. Evaluate the following limits.

(a) $\lim_{x \rightarrow \infty} \left(1 + \frac{x}{e^x} \right)^{\frac{2x \cdot e^x}{x^2+7}}$ (5%) (b) $\lim_{x \rightarrow 0^+} \frac{\int_0^{3x^2} (e^t - 1) dt}{x^4 + 3x^2 + 6\cos x - 6}$ (5%)

9. Find the interval of convergence of the power series

$$\sum_{n=1}^{\infty} \frac{(2x-1)^n}{n \cdot (\ln n)^{\frac{3}{4}}}. \quad (10\%)$$