

國立臺北大學 105 學年度日間學士班暨進修學士班轉學生招生考試試題

系 別：資訊工程學系、通訊工程學系日間學士班 2 年級 考試時間：80 分鐘

科 目：微積分

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可 不可 使用計算機

計算與證明題(請適當敘述計算或證明過程，無過程者不給分)

1. Please evaluate the integrals:

(a) $\int x^2 e^x dx$ (10%)

(b) $\int x e^{x^2} dx$ (10%)

(c) $\int \frac{1}{x\sqrt{x^2+4}} dx$ (15%)

(d) $\iint_D x + 2y dA$, where D is the region bounded by the parabolas $y = 2x^2$ and $y = 1 + x^2$. (15%)

2. Please sketch the curve $y = \frac{2x^2}{x^2-1}$. (You must describe the domain, intercepts, symmetry, asymptotes, interval of increasing or decreasing, local maximum and minimum values, and concavity and points of inflection.) (15%)

3. If $f(x, y) = \frac{xy}{x^2+y^2}$, does $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ exists? Why? (10%)

4. A rectangular box without a lid is to be made from $12m^2$ of cardboard. Please use the method of Lagrange multiplier to find the maximum volume of such a box. (10%)

5. Find the radius of convergence and interval of convergence of the series $\sum_{n=0}^{\infty} \frac{(-3)^n x^n}{\sqrt{n+1}}$. (15%)

試題隨卷繳交