

國立臺北大學 108 學年度日間學士班轉學生招生考試試題

學制系級：通訊工程學系、資訊工程學系日間學士班 2 年級

科目：微積分

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可 不可使用計算機

注意事項：(1)請按題號順序作答，並註明題號。(2)可用鉛筆。(3)不可使用計算機。
(4)計算題需要計算過程。

- (15%) Find the local maximum and minimum values and saddle points of the function $f(x, y) = e^y(y^2 - x^2)$.
- (10%) The length ℓ , width w , and height h of a box change with time. At a certain instant the dimensions are $\ell = 1\text{m}$ and $w = h = 2\text{m}$, and ℓ and w are increasing at a rate of 2 m/s while h is decreasing at a rate of 3 m/s. At that instant find the rates at which the length of a diagonal are changing. (The length of diagonal $L = \sqrt{\ell^2 + w^2 + h^2}$.)
- (25%) Sketch the graphs of $y = \sqrt{x^2 + x} - x$.
(You need to describe A: domain; B: intercepts; C: asymptotes(horizontal and vertical if any); D: intervals of increase and decrease; E: local maximum and minimum values; F: interval of concavity; G: point of inflection; H: sketch the curve)
- (15%) Evaluate the integrals:
 - $\int \tan^{-x} dx$
 - $\int_{-1}^1 \frac{1}{x^{2/3}} dx$
 - $\int_1^4 \frac{\ln 2 \log_2 x}{x} dx$
- (20%) Given the series $\sum_{n=1}^{\infty} (\sqrt{n+1} - \sqrt{n})(x-3)^n$, (a) find the series' radius and interval of convergence. For what values of x does the series converge (b) absolutely, (c) conditionally?
- (15%) Sketch the region of integration, and evaluate the integral. $\iint_R xy dA$ where R is the region bounded by the lines $y = x$, $y = 2x$, and $x + y = 2$.

試題隨卷繳交