

國立臺北大學 106 學年度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 2 年級(學士班)

考試時間：80 分鐘

通訊工程學系 2 年級(學士班)

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科目：微積分

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。

1. (20%) Find dy/dx where

(a) $\cos(xy) = 1 + \sin y$.

(b) $y = \int_0^{x^2-1} (t+1)^2 e^{t^2+2t+1} dt$.

(c) $y = \cos^{-1}(2x+1)$.

(d) $y = \tanh(1 + e^{2x})$.

2. (5%) Find $(f^{-1})'(2)$ if $f(x) = 1 + 2x + e^x$.

3. (25%) Sketch the graphs of $y = \frac{x}{1 - \ln x}$.

(You need to describe (a) domain, (b) intercepts, (c) asymptotes (horizontal and vertical if any), (d) intervals of increasing and decreasing, (e) local maximum and minimum values, (f) interval of concavity, (g) points of inflection and (h) sketch the curve.)

4. (10%) Evaluate the integral $\int_1^2 (\ln(x+1))^2 dx$.

5. (10%) Given the power series $\sum_{n=1}^{\infty} \frac{1}{2 \cdot 4 \cdot 8 \cdots (2n)} x^n$, (a) find the series' radius and interval of convergence. For what values of x does the series converge (b) absolutely, (c) conditionally?

6. (15%) Use the method of Lagrange multipliers to find the maximum and minimum values of $x^2 + y^2$ subject to the constraint $x^2 - 2x + y^2 - 4y = 0$.

7. (15%) Find the area of the region R enclosed by the lines $y = x - 2$ and $y = -x$ and the curve $y = \sqrt{x}$.