

# 國立臺北大學 113 學年度碩士班一般入學考試試題

系(所)組別：都市計劃研究所甲組

科目：微積分

第1頁 共1頁

可 不可使用計算機

1. (10%) Suppose the function  $f(x) = \frac{1}{3}x^3 - ax^2 + bx + c$  has extreme values at  $x = 1, \frac{1}{3}$  and  $f(3) = 5$ . Find  $a, b, c$ .

2. (10%) Find the local extrema of  $f(x) = \frac{12}{5}x^5 + \frac{23}{4}x^4 - 4x^3 - \frac{17}{2}x^2 + 6x + 3$ .

3. (20%) Evaluate the following limit.

A.  $\lim_{x \rightarrow 0} \left(\frac{1}{x^3}\right)^x$

B.  $\lim_{y \rightarrow \pi/2} \left(\frac{\pi}{2} - y\right) \cot(y)$

C.  $\lim_{t \rightarrow 1} \frac{t-1}{\ln t - \cos(\pi t)}$

D.  $\lim_{x \rightarrow 3} \frac{x-3}{x^2-9}$

4. (20%) Evaluate the following integrals.

A.  $\int_0^2 x\sqrt{16-x^2} dx$

B.  $\int x \cos x dx$

C.  $\int \frac{e^x + e^{-x}}{e^x - e^{-x}} dx$

D.  $\int \frac{3x-2}{3x^2+x-2} dx$

5. (10%) Find the tangent line of  $x^3 - 2x^2y + 2xy^3 = 1$  passing through  $(1,1)$ .

6. (15%) Find  $\iint_R x + y dA$ , where  $R = \{(x,y) | 0 \leq 2y \leq x+4, x \leq y \leq x-1\}$ .

7. (15%) Find the radius of convergence of the power series.

A.  $\sum_{n=0}^{\infty} (x+1)^n$

B.  $\sum_{n=0}^{\infty} \frac{x^{2n+1}}{(n+1)!}$

C.  $\sum_{n=0}^{\infty} \frac{(4x-5)^{2n+1}}{n^{3/2}}$