# 國立臺北大學114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

科　　目：微積分



☐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 $x=1,2$ and $f(1)=5$. Find $a,b,c$.

2. (10%) Find the local extrema of $f(x)=\frac{1}{5}x^5-\frac{1}{2}x^4-x^3+4x^2-4x+3$ for $x\in(-3,3)$.

3. (20%) Evaluate the following limit.

   A. $\lim_{x\to 0}\left(\frac{1}{x^2}\right)^x$

   B. $\lim_{x\to \pi/2} x\tan(x)$

   C. $\lim_{t\to 1}\frac{t-1}{\ln t}$

   D. $\lim_{x\to 2}\frac{x-2}{x^2-4}$

4. (20%) Evaluate the following integrals.

   A. $\int_0^{\sqrt[3]{7}} x^2\sqrt{16-x^3}\,dx$

   B. $\int x\sin x\,dx$

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

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

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

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

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

   A. $\sum_{n=0}^{\infty}x^n$

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

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

試題隨卷繳交