國立臺北大學101學年度碩士班一般入學考試試題

系（所）別：都市計劃研究所乙組

科　　目：微積分

□可 ☑不可使用計算機

1. (15%) Find the following limits.

   A. $\lim_{\theta\to 0}\frac{\sin\theta}{\theta}$

   B. $\lim_{x\to 1}\frac{3x^3-4x^2+2x-1}{x^2-1}$

   C. $\lim_{x\to\infty}\frac{2+\sqrt{x}}{2-\sqrt{x}}$

2. (20%) Find dy/dx.

   A. $y=x^2e^{-(x^2/2+2x+1)}$

   B. $y=\left(\frac{2+\sqrt{x}}{2-\sqrt{x}}\right)^2$

   C. $y=\ln\left(\frac{4x}{4x+1}\right)$

   D. $x^3+y^3-9xy=0$

3. (25%) Evaluate the following integrals.

   A. $\int xe^{-3x^2}dx$

   B. $\int_{-\infty}^{\infty}e^{-x^2}dx$

   C. $\int\frac{1}{1+e^{-2x}}dx$

   D. $\int\frac{1}{1-x^2}dx$

   E. $\int 3y\sqrt{7-3y^2}dy$

4. (10%) Find the area of the region enclosed by x axis and curves $y=x^2$ and $y=-x^2+4$.

5. (20%) Determine whether the following series converge. Give reasons for your answers. If a series converges, find its sum.

   A. $\sum_{n=0}^{\infty}\left(\frac{1}{\sqrt{2}}\right)^n$

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

6. (10%) Find Maclaurin series for $\sin^2 x$.