# 國立臺北大學 108 學年度碩士班一般入學考試試題

系（所）組別：財政學系

科　　目：微積分



☐可 ☑不可 使用計算機

1. (16%) (a) Find $\lim_{x\to\infty} \frac{\ln x}{\ln \sqrt{x}+10}$. (b) Find $\lim_{x\to 1} \frac{x^2-1}{|x-1|}$ if it exists.

2. (14%) (a) What is the definition of the derivative of a function $f$ at a point $x_0$?

   (b) Using the definition to calculate the derivatives of the function:

   $f(x) = \sqrt{2x+1}$.

3. (10%) Find the constants $a$ and $b$ such that the function

$$f(x) = \begin{cases} x^2 - 2x, & x \le 1 \\ ax + b, & x > 1 \end{cases}$$ is differentiable at $x = 1$.

4. (10%) Find the integral: $\int \ln x \, dx$.

5. (10%) If $f(x) = \frac{g(x)}{1+x^2e^x}$, where $g(1) = g'(1) = e$, find $f'(1)$.

6. (10%) Use logarithmic differentiation to find $f'(x)$ if $f(x) = \frac{e^{-3x}\sqrt{2x-5}}{(6-5x)^4}$.

7. (10%) Find the vertical and horizontal asymptotes of the graph of $f(x) = \frac{1-x^2}{8-(\sqrt{2}x)^2}$.

8. (10%) Find the areas of the regions enclosed by the curve $y^2 = 4x + 4$ and line $y = 4x - 16$.

9. (10%) Evaluate the integral: $\int_0^2 \int^{4-x^2} \frac{xe^{2y}}{4-y}\, dydx$.

試題隨卷繳交