

# 國立屏東大學 106 學年度研究所碩士班入學考試

## 微積分 試題

(應用數學系碩士班)

※請注意：1.本試題共一頁。

2.答案題號須標示清楚，並寫在答案卷上，否則不予計分。

計算題 (每題 10 分，共 100 分)

1. Find the limits: (a)  $\lim_{x \rightarrow \infty} \frac{2x^2 - 100 \sin x}{7x^2 + 100 \cos x}$ , (b)  $\lim_{x \rightarrow \infty} (5 - 5e^{-5x})$ .
2. Find  $\frac{dy}{dx}$  given that  $x y + \cos x - \sin y = 1$ .
3. Find the derivatives of the functions: (a)  $f(x) = e^{\cos 4x}$ , (b)  $g(x) = \ln\left(\frac{x+1}{x-1}\right)$ .
4. Find (a)  $\int \cos 6x dx$ , (b)  $\int_1^3 \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right) dx$ .
5. Determine the convergence or divergence of  $\sum_{n=1}^{\infty} \frac{\sqrt{n}}{n^2 + 1}$ .
6. Find the area of the region bounded by the graphs of  $x = y^2$  and  $y = x - 2$ .
7. Evaluate  $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$ .
8. Find the critical numbers of  $f(x) = x - 3x^{\frac{1}{3}}$ .
9. Find  $\int e^x \sin x dx$
10. Find the volume of the solid obtained by revolving the region under the graph of  $y = \sqrt{x}$  on  $[0, 2]$  about the  $x$ -axis.