

東海大學 104 學年度碩士班招生考試試題

考試科目：微積分 B

應考系組：財經聯招

科目代碼：40223

考試日期：104 年 03 月 08 日第 2 節

使用計算機：可

共 1 頁，第 1 頁

1. Evaluate the following limits. (20%)

(a) $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1}$

(b) $\lim_{x \rightarrow \infty} \frac{4x^2 - 5x + 1}{x^2 + 3x + 1}$

(c) $\lim_{x \rightarrow \infty} \frac{\ln x}{e^x}$

(d) $\lim_{x \rightarrow 0^+} x \ln x$

2. Evaluate the following integrals. (20%)

(a) $\int_0^1 (2x+1)^3 dx$

(b) $\int_0^1 xe^x dx$

3. Find the absolute extrema of the function (10%)

$$f(x) = x^3 + 3x^2 + 1, \quad -3 \leq x \leq 2$$

4. Sketch the graph of the function $f(x) = 2x^3 + 3x^2 - 12x - 7$. (20%)

5. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be differentiable, $f(1) = 1 = f'(1)$, and $g(x) = [f(1-2x)]^3$. Evaluate $g'(0)$. (10%)

6. Find the minimum of the function $f(x, y) = x^2 + 2y^2 - xy$ subject to the constraint $2x + y = 22$. (10%)

7. Find all critical points for the function $f(x, y) = x^2 + 2y^2 - xy + 14y$ and classify each as a relative maximum, a relative minimum, or a saddle point. (10%)