

## First Midterm

## • 考試注意事項

1. 答案紙直行對折，兩直欄書寫作答。
2. 無清楚計算過程，不予計分。

## • 試題

1. (15%) Find  $\int_1^2 x \ln x \, dx$ .
2. (15%) Use the Integral Test to determine whether  $\sum_{n=1}^{\infty} \frac{\ln n}{n}$  converges or diverges.
3. (15%) Find  $\int \frac{4x^3 + x}{2x^2 + x - 3} \, dx$ .
4. (15%) Evaluate  $\int_0^{\infty} \frac{e^{-\sqrt{x}}}{\sqrt{x}} \, dx$ .
5. (10%) Find  $\int \frac{1}{(4 + x^2)^{3/2}} \, dx$ .
6. (10%) Use the method of partial sum to find the sum of the series  $\sum_{n=1}^{\infty} \frac{4}{4n^2 - 1}$ .
7. (10%) Find  $\lim_{n \rightarrow \infty} \frac{n!}{n^n}$ , where  $n! = n(n-1)(n-2) \cdots 1$ .
8. (10%) Determine whether the series  $\sum_{n=1}^{\infty} \frac{1}{n^2 + 2}$  converges or diverges.