

## Second Midterm

考試注意事項：

1. 答案紙直行對折，兩直欄書寫作答。題號請標示清楚在答案紙上。
2. 無清楚計算過程，不予計分。
3. 沒依題目要求，不予計分。

試題：

1. (20%) Find the absolute maximum and absolute minimum, if any, of the function:

$$g(x) = \cos x - \sin x \quad \text{on} \quad [0, 2\pi].$$

2. (20%) Find the relative extrema, if any, of the function:

$$f(x) = 2 \sin x + \sin 2x, \quad 0 < x < \pi.$$

3. (20%) Find  $\frac{dx}{dy}$  if

$$\int_0^x \sqrt{3 + 2 \cos t} \, dt + \int_0^y \sin t \, dt = 0.$$

4. (10%) Find the limit

$$\lim_{x \rightarrow \infty} \left( \frac{x^3}{3x^2 - 2} - \frac{x^2}{3x + 1} \right).$$

5. (10%) Find the indefinite integral

$$\int (x^2 + x - 1)^{99} (2x + 1) \, dx.$$

6. (10%) Evaluate the limit after first finding the sum (as a function of  $n$ ) using the summation formulas:

$$\lim_{n \rightarrow \infty} \sum_{k=1}^n \left( 1 + \frac{2k}{n} \right)^2 \left( \frac{1}{n} \right).$$

7. (10%) Evaluate the integral

$$\int_0^{\pi} |\cos x| \, dx.$$