

First Midterm

考試注意事項：

1. 此次考試，禁用 L'Hôpital's rule（羅必達規則）。
2. 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。
3. 無清楚計算過程，不予計分。
4. 沒依題目要求，不予計分。

試題：

1. (20%) Find $\lim_{x \rightarrow 0} x^2 \sin \frac{1}{x}$.
2. (20%) Use the **definition of the derivative** of a function to find $f'(x)$ for $f(x) = \sqrt{x}$.
3. (20%) Find an equation of the tangent line to the graph
$$x \sin y - y \cos 2x = 2x$$
at the point $(\frac{\pi}{2}, \pi)$.
4. (10%) Find $\lim_{x \rightarrow 2} \left| \frac{x^2 + x - 6}{x - 2} \right|$.
5. (10%) Find $f''(x)$ if $f(x) = x^{-1} + 3x^{-2}$.
6. (10%) Find the derivative of $y = \frac{\sin x}{1 - \cos x}$.
7. (10%) Find the derivative of the function $y = \sqrt{x + \cos x}$.