Calculus I

First Midterm

考試注意事項 :

1. 答案紙直行對折，兩直攔書寫作答。

2. 無清楚計算過程，不予計分。

3. 未依題目要求作答，不予計分。

試題 :

1. (15%) Find $\lim\limits_{x \to 0} x^2 \sin \dfrac{1}{x}$.

2. (15%) Use the **definition of the derivative** to find the derivative of the function:
$$y = \frac{1}{x+1}.$$

3. (15%) Find an equation of the tangent line at the point on the graph of $y = x^2 \sin 3x$, where $x = \pi/2$.

4. (15%) Find $\dfrac{dy}{dx}$ at the point $\left(\frac{\pi}{2}, \pi\right)$ if $x \sin y - y \cos 2x = 2x$.

5. (10%) Find $\lim\limits_{x \to 0} \dfrac{\sin 2x}{3x}$.

6. (10%) Let
$$f(x) = \begin{cases} x + 2 & \text{if } x \le 1 \\ kx^2 & \text{if } x > 1 \end{cases}$$
Find the values of k that will make f continuous on $(-\infty, \infty)$.

7. (10%) Find an equation of the tangent line to the graph of
$$f(x) = \frac{(2x^2 + 1)(x^3 - 1)}{x^2 + 4}.$$
at the point where $x = 1$.

8. (10%) Find an equation of the tangent line to the graph of $y = x \sin x$ at the point where $x = \pi/2$