

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。
3. 沒依題目要求，不予計分。

試題：

1. (15%) Find an equation of the tangent line to the curve $y = \sin xy$ at the point $(\frac{\pi}{2}, 1)$.
2. (15%) Prove that $f(x) = x^5 + 6x + 4$ has exactly one zero in $(-\infty, \infty)$.
3. (15%) Find f by solving the initial value problem: $f'(x) = 1 + \frac{1}{x^2}$, $f(1) = 2$.
4. (15%) Use the definition of definite integral to evaluate $\int_{-1}^3 (4 - x^2) dx$.

5. (10%) Find the horizontal asymptotes of the graph of the function

$$f(x) = \frac{3x}{\sqrt{x^2 + 1}}$$

6. (10%) Find the relative extrema of the function $f(x) = x^3 - 3x^2 - 24x + 32$.
7. (10%) Determine where the graph of the function $g(x) = x^3 - 6x^2 + 2x + 3$ is concave upward and where it is concave downward. Also, find all inflection points of g .
8. (10%) Find $\int \frac{\cos \sqrt{x}}{\sqrt{x}} dx$