除了選擇,填充和簡答題之外,你的答案必須提供完整說明,如果只有答案沒有任何說明得零分!

1. (10 points) Find an equation of the tangent line to the curve defined by $2(x^2 + y^2)^2 = 25(x^2 - y^2)$ at the point $(3, 1)$.

2. (10 points) Use implicit differentiation to find the slope of the tangent line at the point $(\pi/8, \pi/8)$: $\tan(x + y) + \sec(x - y) = 2$.

3. (5+5=10 points) 簡答題. (a) If $f(x) = \ln(\sin^2 x)$, find $f'(\pi/4)$.

   (b) If $g(t) = \sqrt{1 + \ln t}$, find $g'(2)$

4. (10 points) Find y' if $x^y = y^x$.

5. (5+5=10 points) 簡答題. (a) Differentiate fhe function $f(x) = 2^x \cdot \log_2 x$

(b) $y = \ln\left(\dfrac{x^3}{10^x}\right)$, find $y'(1)$

6. (10 points) 推導以下公式: $\dfrac{d}{dx}\left(\ln\sqrt{\dfrac{1-\cos x}{1+\cos x}}\right) = \csc x$