

計算下列各算式或問題，每題 10 分

1. $\lim_{x \rightarrow 0} \frac{\sqrt[3]{x+8} - 2}{x} = ?$

2. Find $\frac{d^2y}{dx^2}$ for $x^2 + y^2 = 1$.

3. Find the maximum and minimum values of the function $f(x) = \frac{1}{x^2 - 9}$, $x \in [-2, 2]$.

4. $\int \frac{\cos \sqrt{t}}{\sqrt{t}} dt = ?$

5. $\int_0^{2\pi} |\cos 2x| dx = ?$

6. Use logarithmic differentiation to find $\frac{dy}{dx}$ for $y = x^{\cos^2 x}$.

7. $\int_0^{\pi/3} \cos x \cos 3x dx = ?$

8. $\int x \cos x dx = ?$

9. $\lim_{x \rightarrow 0} \frac{\sin 4x}{\sin 5x} = ?$

10. Determine whether $\sum_{k=1}^{\infty} \left(\frac{k}{3k+2}\right)^k$ converges or diverges and state which test you used.