

Final Test

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。

試題：

1. (15%) Find the derivative $\int_1^{\cos x} \frac{t^2}{t+1} dt$.
2. (15%) Let R be the region bounded by the graphs of the equations $y = 4 - x^2$ and $y = -x + 2$. Find the volume of the solid obtained by revolving R about the line $x = 4$.
3. (15%) If $f(x) = \int_2^x \frac{dt}{\sqrt{1+t^3}}$, where $x > -1$, what is $(f^{-1})'(0)$?
4. (15%) Use **L'Hopital's Rule** to evaluate $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^{2x}$.
5. (10%) Find the area of the region between the graph of $y = x^2 + 2$ and $y = x - 1$ and the vertical line $x = -1$ and $x = 2$.
6. (10%) Evaluate $\int_0^1 \frac{e^x}{1+e^x} dx$.
7. (5%, 5%)
 - (a) Evaluate $\int_0^3 2^x dx$.
 - (b) Find the derivative of $g(x) = 3\sqrt{x}$.
8. (5%, 5%)
 - (a) Find the derivative of $f(x) = \cos^{-1} 3x$.
 - (b) Find $\int \frac{e^x}{e^{2x} + 1} dx$.