

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%) 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  $x = 4$ .
2. (15%) If  $f(x) = \int_2^x \frac{dt}{\sqrt{1+t^3}}$ , where  $x > -1$ , what is  $(f^{-1})'(0)$ ?
3. (15%) Find the derivative of  $f(x) = x^x$ .
4. (15%) Evaluate  $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$ .
5. (10%) Find the area of the region bounded by the graphs of  $y = 2 - x^2$  and  $y = -x$ .
6. (10%) Find the volume of the solid obtained by revolving the region under the graph of  $y = \sqrt{x}$  on  $[0, 2]$  about the  $x$ -axis.
7. (10%) Evaluate the integral  $\int_{-1}^0 \frac{1}{1 + e^{-2x}} dx$ .
8. (10%)
  - (a) Find the derivative of  $f(x) = \tan^{-1} x^2$ .
  - (b) Evaluate the integral of  $\int \frac{1}{\sqrt{16 - x^2}} dx$ .