

考試時間 50 分鐘，滿分 50 分。請在考試卷上以中文或英文盡量依序作答，請詳列計算過程，否則不予計分。需標明題號但不必抄題。考試卷務必寫學號、姓名，試題不必繳回。

1. (5 points) For each graph of the function shown below, sketch the graph of the inverse (restrict the function's domain if necessary).
2. (5 points) Find the critical points of $f(x) = x^2e^x$ and determine whether they are local minima, maxima, or neither.
3. (5 points) Evaluate $\int e^t \sqrt{e^t + 1} dt$.
4. (5 points) Find the volume obtained by revolving $y = e^x$ about the x -axis for $0 \leq x \leq 1$.
5. (10 points) The following figure shows the solid S obtained by intersecting two cylinders of radius r whose axes are perpendicular. Find the area of the horizontal cross section of S at distance y . Then find the volume of S as a function of r .

(背面還有)

6. (10 points) Compute the volume of the solid obtained by rotating the region in the following figure about the axis:

(a) $x = 4$, (b) $y = -2$.

7. (10 points) Calculate the work (in *Joules*) required to pump all water out of the horizontal cylinder tank which has a small hole at the top for water to exit, as shown in the following figure. Assume that the tank is full, distances are measured in meters, and the density of water is $1,000 \text{ Kg/m}^3$.