

系所組別： 企業管理學系丁組

考試科目： 微積分

考試日期： 0308，節次： 3

※ 考生請注意：本試題 ☒可 ☐不可 使用計算機

Please show all your work.

1. (10%) A water tank has the shape of an inverted circular cone with base radius $2m$ and height $4m$. If water is being pumped into the tank at a rate of $2m^3/\text{min}$, find the rate at which the water level is rising when the water is $4m$ deep.
2. (10%) Find the volume of a pyramid whose base is a square with side x and whose height is y .
3. (10%) Find $\lim_{x \rightarrow 0^+} (1 + \sin 4x)^{\cot x}$
4. (10%) Evaluate $\int \frac{1}{3 \sin x - 4 \cos x} dx$
5. (10%) Evaluate $\int_{-1}^3 \frac{1}{x^2} dx$
6. (10%) What are the points on the curve $5x^2 + 6xy + 5y^2 = 8$ that are closest to the origin?
7. (10%) Find $\int \frac{3^x + 3^{-x}}{3^x - 3^{-x}} dx$
8. (10%) Find the general solution to $y'' - 3y' + 2y = 4x + e^{2x}$, $y(0) = 0$, $y'(0) = 1$
9. (10%) Find $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{2n-1}$
10. (10%) Find the volume of the largest right circular cylinder that can be inscribed in a sphere of radius x .