

國立台灣科技大學九十五學年度碩士班招生試題

系所組別：工業管理系碩士班丁組

科目：微積分

總分 100 分

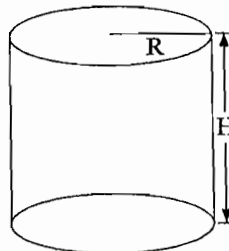
1. Let $y = |x^2 + 4x - 5|$. Find $\frac{dy}{dx}$. 10 分

2. Use a differential to estimate the value of $\frac{1}{\sqrt[3]{6}}$. (This method is also called the tangent line approximation or the linear approximation.) 10 分

3. Evaluate $\lim_{x \rightarrow 2} \sqrt{x^2 - 4}$. 10 分

4. Let $f(x) = 5\sqrt[3]{x}$. Find the derivative $(f^{-1})'(5)$. 10 分

5. A manufacturer wishes to produce a cylindrical can that holds exactly 1000 cubic inches. Find the dimensions of the can that costs the least to produce if the top and bottom are made out of the material that costs 10 cents per square inch and the side is made out of the material that costs 20 cents per square inch. 10 分



6. Find the integral

(1) $\int \frac{x}{\sqrt{x+4}} dx$ 6 分

(2) $\int \frac{1 + \sin x}{1 - \sin x} dx$ 6 分

(3) $\int_0^1 \frac{\ln x}{2} dx$ 6 分

7. Find an equation for the tangent line to the curve $y = F(x)$ at the point P where $x = 1$ and 8 分

$$F(x) = \int_1^{\sqrt{x}} \frac{2t+1}{t+2} dt.$$

8. Find the length of the arc of the curve $y = 3x^{\frac{3}{2}} - 10$ from the point $y = 2$ to the point $y = 17$. 8 分

9. Let D be the region bounded by the lines $y = x$, $y = 2x$ and $x = 1$. Find the volume of the solid formed by D is revolved about the x -axis. 8 分

10. If f is a differentiable function of θ , show that the tangent line to the polar curve $r = f(\theta)$ at 8 分

the point $P(r, \theta)$ has slope $m = \frac{f(\theta) \cos \theta + f'(\theta) \sin \theta}{-f(\theta) \sin \theta + f'(\theta) \cos \theta}$ whenever the denominator is

not zero.

