

國立高雄師範大學 109 學年度學士班轉學生招生考試試題

系所別：電機工程學系 二年級

科 目：微積分（全一頁）

※注意：1.不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上，於本試題上作答者，不予計分。

2.限用藍色或黑色之鋼筆、原子筆作答，以鉛筆或其他顏色作答者不予計分。

1. (a) Find $\lim_{x \rightarrow 0} \left[\frac{2 \sin(x) - \sin(2x)}{x - \sin(x)} \right]$. (5%)

(b) Given that $\text{sinc}(x) \triangleq \frac{\sin \pi x}{\pi x}$, find the value of $\text{sinc}(0)$ according to the limit theorem. (5%)

2. (a) Find $\left. \frac{d}{dx} \left(\frac{\cos x(1-x)}{1+x} \right) \right|_{x=0}$. (5%)

(b) Show that $\frac{d}{dx} a^x = a^x \ln(a)$. (5%)

3. Find the relative extrema of the function $f(x) = x^3 + 3x^2 - 9x - 13$. (10%)

4. For the curve $y^2 + 2x^2y - x^4 = 7$,

(a) find $\frac{dy}{dx}$; (5%)

(b) find the slope of the tangent line to the curve at the point $(1, 2)$. (5%)

5. Evaluate the following integrals.

(a) $\int 16x^3 \ln(x) dx$ (5%) (b) $\int_0^\pi \cos(2x) \sin(4x + \pi/4) dx$ (5%)

6. Evaluate $\int_3^5 t\sqrt{t^2 - 9} dt$. (10%)

7. Evaluate $\int_1^3 y dx$, where $x = 2t - 1$ and $y = t^2 + 2$. (10%)

8. Evaluate $\iint_R x e^{y^2} dA$ over the region R in the first quadrant bounded by the graphs of $y = x^2, x = 0, y = 4$ (see Fig.1). (10%)

9. Evaluate $\int_0^4 \int_{\sqrt{y}}^2 \sqrt{x^3 + 1} dx dy$ by reversing the order of integration. (Hint: Draw the integration area first.) (10%)

10. $\vec{r}(t) = 2\cos t \vec{i} + (1 + \sin t) \vec{j}$ is the position vector of a moving particle. Find the speed at the time, $t = \frac{\pi}{3}$. (10%)

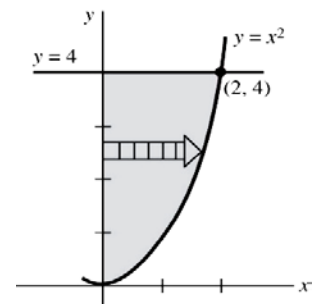


Figure 1.