臺灣綜合大學系統113學年度學士班轉學生聯合招生考試試題

科目名稱	微積分A	類組代碼	共同考科
		科目碼	E0011

※本項考試依簡章規定所有考科均「不可」使用計算機。　　本科試題共計 1 頁

答題時需詳述計算過程，否則不予計分。

1. (10%) Find $\lim_{x\to 1^+} \frac{|x^2-1|}{x-1}$ and $\lim_{x\to 1^-} \frac{|x^2-1|}{x-1}$.

2. (10%) Find the derivative $f'(0)$ for the function $f(x) = \int_{\tan x}^{\sec x} \frac{1}{\sqrt{1+t^4}} dt$.

3. (10%) Find the absolute maximum and absolute minimum values of $f(x) = \frac{x}{x^2-x+1}$ on the interval $[-2, 0]$.

4. (10%) Evaluate the integral $\int_0^{1/2} \sqrt{1-4x^2} dx$.

5. (10%) Evaluate the improper integral $\int_0^1 x \ln x dx$.

6. (10%) Find the interval of convergence of the power series $\sum_{n=1}^{\infty} \frac{x^n}{\sqrt{n}}$.

7. (10%) Find the direction in which the function $f(x, y) = \ln(xy)$ decreases fastest at the point $(1, 2)$? What is the rate of decrease?

8. (10%) Find the arc length for the circular helix with vector function $\mathbf{r}(t) = \cos 2t\ \mathbf{i} + \sin 2t\ \mathbf{j} + t\ \mathbf{k}$ from the point $(1, 0, 0)$ to the point $(1, 0, \pi)$.

9. (10%) Evaluate the integral $\int_0^1 \int_0^{\sqrt{x-x^2}} \sqrt{x^2+y^2}\, dydx$.

10. (10%) Evaluate the line integral $\int_C \frac{y}{x^2+y^2} dx - \frac{x}{x^2+y^2} dy$, where C is the counterclockwise oriented ellipse $4x^2 + 9y^2 = 36$.