

招生學年度	106	招生類別	碩士班
系所班別	運籌管理研究所碩士班、財務金融學系碩士班（金融大數據組）		
科目名稱	微積分		
注意事項	本考科可使用掌上型計算機		

- 試應用夾擊定理求解 $\lim_{x \rightarrow 0} x^2 \sin \frac{1}{x}$ (10%)
- Find the following integrals: (a) $\int \frac{1}{\sqrt{3x^2-1}} dx$ (b) $\int x^2 \ln x dx$ (10%)
- If $f(x) = x^5$, $g(x) = -7x$, find $(f \circ g)'(x)$ and $(g \circ f)'(x)$ (10%)
- 試證明 $\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n = e$ (15%)
- Let $f(x, y) = \frac{x^3 - xy^2}{x^2 + y^2}$, if $(x, y) \neq (0, 0)$, and $f(0, 0) = 0$.
Find (a) $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ (b) $f_y(0, 0)$ (15%)
- Let $f(x, y) = \frac{\sin(x-y)}{\cos(x+y)}$, Find $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ (10%)
- Evaluate the following integrals: (a) $\int_0^{\frac{\pi}{4}} \frac{3 \cos \theta}{\sqrt{2 - \sin^2 \theta}} d\theta$ (10%)
- Check the convergence or divergence of the following series.
 $\sum_{n=1}^{\infty} \frac{3}{2+e^n}$ and give a proof. (20%)