

招生學年度	105	招生類別	碩士班
系所班別	應用數學系碩士班		
科目名稱	微積分		
注意事項	本考科禁止使用掌上型計算機		

1. (20 %)

(1a) (10 %)  $\lim_{t \rightarrow 1} [t^3 + t^2 + 3t + 2]$

(1b) (10 %)  $\lim_{x \rightarrow 1^+} \frac{|7x-7|}{7x-7}$

2. (10 %)

Let

$$f(x) = \begin{cases} kx + 17 & \text{if } x \leq 2 \\ kx^2 + 3 & \text{if } x > 2. \end{cases}$$

Find the value of  $k$  that will make  $f$  continuous on  $(-\infty, \infty)$ .

3. (20 %)

Find the derivative of the function :

(3a) (10 %)  $f(x) = \frac{x^3 - 2x^2 + x - 4}{2\sqrt{x}}$

(3b) (10 %)  $g(x) = \sin(x^3 + x)$

4. (10 %)

Find an equation of the tangent line to  $x^2y + y^3 = 2$  at  $(-1, 1)$

5. (10 %)

(5a) (5 %) Find  $\int \frac{x^2 - 2x + 3}{\sqrt{x}} dx$

(5b) (5 %) Find  $\int \frac{e^x}{1+e^x} dx$

6. (10%)

Let  $z = f(x, y) = \int_x^y te^{-t} dt$ . Find  $\frac{\partial z}{\partial x}$  and  $\frac{\partial z}{\partial y}$ .

7. (10%)

Find the extrema of  $f(x, y) = x^2 + 2y^2$  subject to  $x^2 + y^2 \leq 1$ .

8. (10%)

Find  $\int_0^1 \int_x^1 \sin y^2 dy dx$ .