

科目：微積分

適用：資工系二、應化系二、土木系二、
電機系二、應光系二

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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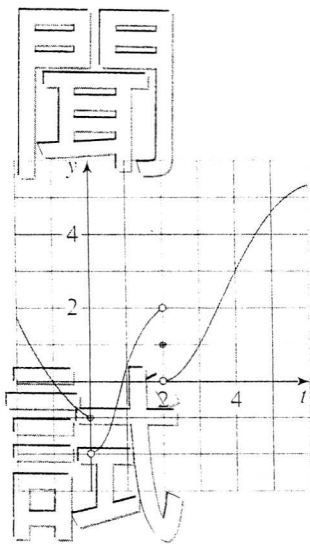
編號：312. 322. 331. 341. 351

1. (3% × 5) Determine whether the statement is true or false:

- (a) $\lim_{x \rightarrow 4} \left(\frac{2x}{x-4} - \frac{8}{x-4} \right) = \lim_{x \rightarrow 4} \frac{2x}{x-4} - \lim_{x \rightarrow 4} \frac{8}{x-4}$
- (b) If p is a polynomial, then $\lim_{x \rightarrow b} p(x) = p(b)$.
- (c) If $f'(r)$ exists, then $\lim_{x \rightarrow r} f(x) = f(r)$.
- (d) $\frac{d^2 y}{dx^2} = \left(\frac{dy}{dx} \right)^2$
- (e) If f and g are increasing on an interval I , then fg is increasing on I .

2. (3% × 5) For the function g whose graph is given, state the value of each quantity, if it exists. If it does not exist, explain why.

- (a) $\lim_{t \rightarrow 0^-} g(t)$
- (b) $\lim_{t \rightarrow 0^+} g(t)$
- (c) $\lim_{t \rightarrow 0} g(t)$
- (d) $g(2)$
- (e) $\lim_{t \rightarrow 4} g(t)$



(以下 3 ~ 8 題均須寫出計算或證明過程方予計分)

3. (10%) Show that $\lim_{x \rightarrow 0} x^2 \sin \frac{1}{x} = 0$.

4. (10%) Find the limit.

(a) $\lim_{x \rightarrow -3} \frac{x^2 - 9}{x^2 + 2x - 3}$

(b) $\lim_{t \rightarrow 0} \frac{t^3}{\tan^3 2t}$

5. (15%) Sketch the graph of $f(x) = \frac{x^3}{x^2 + 1}$.

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6. (10%) Evaluate the integral.

(a) $\int_0^2 x(2 + x^5) dx$

(b) $\int_4^9 \left(\sqrt{x} + \frac{1}{\sqrt{x}} \right)^2 dx$

7. (10%) The region R enclosed by the curves $y = x$ and $y = x^2$ is rotated about the x -axis. Find the volume of the resulting solid.8. (15%) A group of engineers is building a parabolic satellite dish whose shape will be formed by rotating the curve $y = ax^2$ about the y -axis. If the dish is to have a 10-ft diameter and a maximum depth of 2 ft, find the value of a and the surface area of the dish.