

## 2.8 The Derivative as a Function

### 單選題

1. Let  $f(x) = \begin{cases} x|x| & \text{if } -1 \leq x \leq 1 \\ x^2 & \text{if } x > 1 \\ x^3 & \text{if } x < -1 \end{cases}$ . Then  $f$  is not **differentiable** at  $x = ?$

- (A)  $-1$ ; (B)  $0$ ; (C)  $1$ ; (D)  $2$ .

Ans: A [103 學年度]

### 多選題

1. Consider  $f(x) = \begin{cases} x^2 \sin \frac{1}{x^3} & \text{if } x > 0, \\ 0 & \text{if } x \leq 0. \end{cases}$

Which of the following statements are TRUE ?

- (A)  $f$  is continuous on  $\mathbb{R}$ ; (B)  $f$  is differentiable on  $\mathbb{R}$ ;  
(C)  $f'(0) = 0$ ; (D)  $f'$  is continuous on  $\mathbb{R}$ .

Ans: ABC [99 學年度]

2. Which of the following statements are true ?

- (A) If  $f$  is continuous at  $a$ , so is  $|f|$ ;  
(B) If  $x = a$  is a vertical asymptote of  $y = f(x)$ , then  $f$  may or may not be defined at  $a$ ;  
(C) If  $f$  is differentiable at  $a$ , then  $f$  is continuous at  $a$ ;  
(D) If  $f$  is defined on  $[0, \infty)$  and has no horizontal asymptote, then  $\lim_{x \rightarrow \infty} f(x) = \infty$  or  $\lim_{x \rightarrow \infty} f(x) = -\infty$ .

Ans: ABC [102 學年度]

3. Let

$$f(x) = \begin{cases} 0 & \text{if } x < 0 \\ x & \text{if } 0 \leq x \leq 1 \\ 2-x & \text{if } 1 < x \leq 2 \\ 0 & \text{if } x > 2 \end{cases}$$

and  $g(x) = \int_0^x f(t)dt$ .

Which of the following statements are **true** ?

- (A)  $g$  is continuous on all real numbers;
- (B)  $g$  is differentiable on all real numbers;
- (C)  $f$  is continuous on all real numbers ;
- (D)  $f$  is differentiable on all real numbers.

Ans: ABC [103 學年度]