

1~15: 單選題(75%) (每題恰有一正確選項, 答對一題得五分, 答錯或不答時, 不倒扣也不給分)

1. What is the domain of  $f(x) = x^4$  ?

Select the correct answer.

(A)  $(-\infty, \infty)$  (B)  $(0, \infty)$  (C)  $[0, \infty)$  (D)  $(-\infty, 0)$  (E)  $(-\infty, 0]$ .

2. What is the range of  $f(x) = x^4$  ?

Select the correct answer.

(A)  $(-\infty, \infty)$  (B)  $(0, \infty)$  (C)  $[0, \infty)$  (D)  $(-\infty, 0)$  (E)  $(-\infty, 0]$ .

3.  $\lim_{x \rightarrow 0} \frac{\sqrt{4+x} - 2}{x} = ?$

(A) 0 (B)  $\frac{1}{2}$  (C)  $\frac{1}{4}$  (D) 1 (E)  $\infty$ .

4.  $\lim_{x \rightarrow 0^+} x \ln x = ?$

(A) 0 (B)  $\frac{1}{2}$  (C)  $\frac{1}{4}$  (D) 1 (E)  $\infty$ .

5. If  $\lim_{x \rightarrow 1} \frac{f(x) - 8}{x - 1} = 10$ , then  $\lim_{x \rightarrow 1} f(x) = ?$

(A) 0 (B) 1 (C) 2 (D) 4 (E) 8.

6. Let  $f(x) = \begin{cases} 1+x^2 & , x \leq 0 \\ 2-x & , 0 < x \leq 2 \\ (x-2)^2 & , x > 2 \end{cases}$

Find the number at which  $f$  is discontinuous.

(A) -1 (B) 0 (C) 1 (D) 2 (E) none of above.

7. For what value of the constant  $c$  is the following function  $f$  continuous on  $(-\infty, \infty)$ ?

$$f(x) = \begin{cases} cx^2 + x & , x < 2 \\ x^3 - cx & , x \geq 2 \end{cases}$$

(A) -1 (B) 0 (C) 1 (D) 2 (E) none of above.

8.  $\frac{d}{dx} \cos(2x) = ?$

(A)  $\sin(2x)$  (B)  $-\sin(2x)$  (C)  $2\sin(2x)$  (D)  $-2\sin(2x)$  (E) none of above.

9.  $\frac{d}{dx}(x \ln x) = ?$   
 (A)  $x+1$  (B)  $x+\ln x$  (C)  $\ln x + 1$  (D)  $x \ln x$  (E) none of above.
10. Find the minimum value of the function  $f(x) = x(x+100)$  for  $-\infty < x < \infty$ .  
 (A)  $-\infty$  (B)  $-2500$  (C)  $0$  (D)  $100$  (E) none of above.
11.  $\int_0^{\frac{\pi}{2}} \sin x \, dx = ?$   
 (A)  $0$  (B)  $1$  (C)  $2$  (D)  $\frac{\pi}{4}$  (E) none of above.
12. If  $\int_1^5 f(x) \, dx = 2$  and  $\int_4^5 f(x) \, dx = 1$ , then  $\int_1^4 f(x) \, dx = ?$   
 (A)  $0$  (B)  $1$  (C)  $2$  (D)  $3$  (E) none of above.
13.  $\int_1^2 x^{-2} \, dx = ?$   
 (A)  $1$  (B)  $\frac{1}{4}$  (C)  $\frac{1}{3}$  (D)  $\frac{1}{2}$  (E) none of above.
14.  $\frac{d}{dx} \int_0^x t \sin t \, dt = ?$   
 (A)  $t \sin t$  (B)  $x \sin x$  (C)  $x \cos x$  (D)  $\sin x + x \cos x$  (E) none of above.
15.  $\frac{d}{dx} \int_{-x}^x f(t) \, dt = ?$   
 (A)  $f(x)$  (B)  $2f(x)$  (C)  $f(x) + f(-x)$  (D)  $f(x) - f(-x)$  (E) none of above.

16~20 : 複選題(25%) (每題至少有二個正確選項, 完全答對得五分, 其餘情形得 0 分)

16. Let  $f(x) = |x|$ , which of the following statements are correct?  
 (A)  $f(1) = 1$   
 (B)  $f(-1) = -1$ .  
 (C) The domain of  $f(x)$  is  $(-\infty, \infty)$ .  
 (D) The function  $f(x)$  is continuous on  $(-\infty, \infty)$ .  
 (E) The function  $f(x)$  is differentiable on  $(-\infty, \infty)$ .

17. Which of the following functions have the property  $\int_{-1}^1 f(x)dx = 0$
- (A)  $f(x) = x$
  - (B)  $f(x) = \sin x$
  - (C)  $f(x) = \cos x$
  - (D)  $f(x) = x \sin x$
  - (E)  $f(x) = x \cos x$
18. Which of the following statements are correct?
- (A) If  $f(x)$  is continuous at  $x = a$ , then  $f(x)$  is differentiable at  $x = a$ .
  - (B) If  $f(x)$  is differentiable at  $x = a$ , then  $f(x)$  is continuous at  $x = a$ .
  - (C) If  $\lim_{x \rightarrow a} f(x)$  exists, then  $f(x)$  is continuous at  $x = a$ .
  - (D) If  $f(x)$  is continuous at  $x = a$ , then  $\lim_{x \rightarrow a} f(x)$  exists.
19. Let  $f(x)$  and  $g(x)$  be two continuous functions on  $[a, b]$ . Which of the following statements are correct?
- (A)  $\int_a^b f(x) + g(x)dx = \int_a^b f(x)dx + \int_a^b g(x)dx$
  - (B)  $\int_a^b f(x)g(x)dx = \int_a^b f(x)dx \cdot \int_a^b g(x)dx$ .
  - (C)  $\int_a^b 5f(x)dx = 5 \int_a^b f(x)dx$ .
  - (D)  $\int_a^b xf(x)dx = x \int_a^b f(x)dx$ .
20. Which of the following functions are differentiable on  $(-\infty, \infty)$ ?
- (A)  $f(x) = x$
  - (B)  $f(x) = |x|$
  - (C)  $f(x) = |x^3|$
  - (D)  $f(x) = |\sin x|$

ANSWER

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>A</b>	<b>C</b>	<b>C</b>	<b>A</b>	<b>E</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>C</b>	<b>B</b>

<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>
<b>B</b>	<b>B</b>	<b>D</b>	<b>B</b>	<b>C</b>

<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
<b>(A,C,D)</b>	<b>(A,B,E)</b>	<b>(B,D)</b>	<b>(A,C)</b>	<b>(A,C)</b>