※Single Choice (1~15, 5% each)（每題恰有一解,答對得 5 分,答錯或不答得 0 分）

1. Find the domain of the function $f(x)=\frac{1}{x^2+1}$.

Select the correct answer.

(A) $(-\infty,\infty)$ (B) $(-\infty,1]$ (C) $[1,\infty)$ (D) $[0,1]$ (E) none of above.

2. Find the range of the function $f(x)=\frac{1}{x^2+1}$.

Select the correct answer.

(A) $(-\infty,\infty)$ (B) $(0,1)$ (C) $[0,1)$ (D) $(0,\ 1]$ (E) none of above.

3. Find the limit, $\lim_{x\to 1}\frac{x-1}{x^2-1}=?$

Select the correct answer.

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

4. Find the limit, $\lim_{x\to\infty}\frac{\sin x}{x}=?$

Select the correct answer.

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

5. Which of the following function is continuous on $(-\infty,\infty)$?

Select the correct answer.

(A) $\sin(\frac{1}{x})$ (B) $\frac{1}{\sin x}$ (C) $\frac{1}{x^2+1}$ (D) $\ln x$ (E) none of above.

6. Let $f(x)=\frac{x^3}{x-\sin x}, x\neq 0$. Find the value of $f(0)$ so that $f(x)$ is continuous at $x=0$.

Select the correct answer.

(A) -1 (B) 0 (C) 2 (D) 4 (E) 6.

7. Find $\frac{d}{dx}\sin(3x)=?$

Select the correct answer.

(A) $\cos(3x)$ (B) $-\cos(3x)$ (C) $3\cos(3x)$ (D) $-3\cos(3x)$ (E) none of above.

8. Find $\frac{d}{dx}(x\ln x)=?$

Select the correct answer.

(A) $\ln x$ (B) $x+\ln x$ (C) $1+\ln x$ (D) $x\ln x$ (E) none of above.

9. If $f(x)=g(h(x))$, and $h(3)=3$, $g'(3)=2$, and $h'(3)=4$, find the value of $f'(3)$.
Select the correct answer.
(A) 6 (B) 8 (C) 12 (D) 24 (E) none of above.

10. $\int \ln x\, dx = ?$
Select the correct answer.
(A) $x\ln x + C$ (B) $x\ln x + x + C$ (C) $\ln x + C$ (D) $x\ln x - x + C$ (E) none of above.

11. If $f(0)=1$, $f(1)=3$ and $f'(1)=5$, find the value of $\int_0^1 xf''(x)\,dx$.
Select the correct answer.
(A) 0 (B) 1 (C) 2 (D) 3 (E) 4.

12. $\int_{-1}^{1} \left|x^3\right| dx = ?$ Select the correct answer.
(A) 0 (B) 1 (C) 2 (D) 3 (E) none of above.

13. $\int_{-1}^{1} x^3 dx = ?$ Select the correct answer.
(A) 0 (B) 1 (C) 2 (D) 3 (E) none of above.

14. If $f(x)=\int_0^{x^2} \sqrt{1+t^3}\,dt$, find the value of $f'(2)$.
Select the correct answer.
(A) $\sqrt{65}$ (B) $4\sqrt{65}$ (C) 12 (D) 0 (E) none of above.

15. The position of a particle is given by the equation $S = f(t) = t^3 - 12t^2 + 36t$, where S is measured in meters and t in seconds. When is the particle at rest?
Select the correct answer.
(A) $t=0,2$ (B) $t=0,4$ (C) $t=2,4$ (D) $t=2,6$ (E) $t=4,6$.

※Multiple Choice(16~20, 5% each)(每題至少有二正確選項, 完全答對得5分, 其餘情形得0分)

16. Consider the function $f(x)=e^{-x}$. Select the correct statements.
(A) $f(x)\geq 0$ for every $x\in(-\infty,\infty)$.
(B) $f(x)$ is continuous on $(-\infty,\infty)$.
(C) $f(x)$ is differentiable on $(-\infty,\infty)$.
(D) $\lim_{x\to\infty} f(x)$ does not exist.
(E) $\lim_{x\to 0} f(x)$ does not exist.

17. Which of the following functions are continuous on $(-\infty, \infty)$?

(A) $f(x) = x$

(B) $f(x) = |x|$

(C) $f(x) = \dfrac{1}{x}$

(D) $f(x) = \sin x$

(E) $f(x) = \ln x$

18. Which of the following functions are differentiable on $(-\infty, \infty)$?

(A) $f(x) = x$

(B) $f(x) = |x|$

(C) $f(x) = \dfrac{1}{x}$

(D) $f(x) = \sin x$

(E) $f(x) = \ln x$

19. Which of the following functions have the property $\int_{-1}^{1} f(x)dx = 0$?

(A) $f(x) = x$

(B) $f(x) = |x|$

(C) $f(x) = x^2$

(D) $f(x) = \sin x$

(E) $f(x) = x^2 \sin x$

20. Let c be a constant and $f(x)$ and $g(x)$ be differentiable functions. Which of the following equalities are correct?

(A) $\dfrac{d}{dx}(c\,f(x)) = c\dfrac{d}{dx}f(x)$

(B) $\dfrac{d}{dx}(f(x)+g(x)) = \dfrac{d}{dx}f(x) + \dfrac{d}{dx}g(x)$

(C) $\dfrac{d}{dx}(f(x)\cdot g(x)) = \dfrac{d}{dx}f(x)\cdot\dfrac{d}{dx}g(x)$

(D) $\dfrac{d}{dx}\left(\dfrac{f(x)}{g(x)}\right) = \dfrac{\dfrac{d}{dx}f(x)}{\dfrac{d}{dx}g(x)}$

(E) $\dfrac{d}{dx}(f^2(x)) = 2f(x)\cdot\dfrac{d}{dx}f(x)$.

ANSWER

1	2	3	4	5	6	7	8	9	10
A	D	D	A	C	E	C	C	B	D

11	12	13	14	15
D	E	A	B	D

16	17	18	19	20
A, B, C	A, B, D	A, D	A, D, E	A, B, E