1 Limits, Continuity & Differentiability

1. $\lim\limits_{x\to a}\dfrac{\sqrt{3x-a}-\sqrt{x+a}}{x-a}$ is equal to

(A) $\sqrt{2a}$ (B) $\dfrac{1}{\sqrt{2a}}$

(C) $2a$ (D) $\dfrac{1}{2a}$

2. The value of $\lim\limits_{x\to 2}\dfrac{3^{\frac{x}{2}}-3}{3^x-9}$ is

(A) 0 (B) $\dfrac{1}{3}$

(C) $\dfrac{1}{6}$ (D) ln 3

3. $\lim\limits_{x\to 1}\dfrac{1+\log x-x}{1-2x+x^2}$ is equal to

(A) 1 (B) –1

(C) 0 (D) $-\dfrac{1}{2}$

4. $\lim\limits_{x\to 0}\dfrac{a^{\sin x}-1}{b^{\sin x}-1}$ is equal to

(A) $\dfrac{a}{b}$ (B) $\dfrac{b}{a}$

(C) $\dfrac{\log a}{\log b}$ (D) $\dfrac{\log b}{\log a}$

5. $\lim\limits_{x\to 0}\dfrac{a^x-b^x}{x}$ is equal to

(A) log (ab) (B) $\dfrac{\log a}{\log b}$

(C) $\log\left(\dfrac{a}{b}\right)$ (D) $\log\left(\dfrac{b}{a}\right)$

6. If $\lim\limits_{x\to 0}\dfrac{a^x-x^a}{x^a-a^a}=-1$, then a is equal to

(A) –1 (B) 0

(C) 1 (D) 2

7. $\lim\limits_{x\to 0}\dfrac{a^x-b^x}{e^x-1}$ is equal to

(A) $\log\left(\dfrac{a}{b}\right)$ (B) $\log\left(\dfrac{b}{a}\right)$

(C) log (ab) (D) log (a + b)

8. If $f(x)=\begin{cases}\dfrac{x^2-9}{x-3}, & \text{if } x\neq 3\\ 2x+k, & \text{otherwise}\end{cases}$, is continuous at x = 3 then k is equal to

(A) 3 (B) 0

(C) – 6 (D) $\dfrac{1}{6}$

9. If $\lim\limits_{x\to 0}\dfrac{\sin 2x}{x}$ is equal to

(A) 0 (B) 1

(C) $\dfrac{1}{2}$ (D) 2

10. $\lim\limits_{x\to 0}\dfrac{\tan x-\sin x}{x^3}$ is equal to

(A) 0 (B) 1

(C) $\dfrac{1}{2}$ (D) $-\dfrac{1}{2}$

11. $\lim\limits_{x\to a}\dfrac{\log(x-a)}{\log\left(e^x-e^a\right)}$ is equal to

(A) 0 (B) 1

(C) a (D) Does not exist

12. What is the value of $\lim\limits_{x\to\infty}\dfrac{\sin x}{x}$?

(A) 1 (B) 0

(C) ∞ (D) –1

13. What is the value of $\lim\limits_{x\to -2}\left(\dfrac{x+2}{x^3+8}\right)$

(A) $\dfrac{1}{4}$ (B) $-\dfrac{1}{4}$

(C) $\dfrac{1}{12}$ (D) $-\dfrac{1}{12}$

14. $\lim\limits_{x\to1}\dfrac{x-1}{2x^2-7x+5}$ is equal to

(A) $\dfrac{1}{3}$ (B) $\dfrac{1}{11}$

(C) $-\dfrac{1}{3}$ (D) None of these

15. What is the value of $\lim\limits_{x\to\infty}\left\{x\sin\left(\dfrac{2}{x}\right)\right\}$?

(A) 2 (B) 1

(C) $\dfrac{1}{2}$ (D) ∞

16. Let $f(x)=\dfrac{1}{\sqrt{18-x^2}}$

What is the value of $\lim\limits_{x\to3}\dfrac{f(x)-f(3)}{x-3}$?

(A) 0 (B) $-\dfrac{1}{9}$

(C) $\dfrac{1}{3}$ (D) $\dfrac{1}{9}$

17. $\lim\limits_{\alpha\to\beta}\left[\dfrac{\sin^2\alpha-\sin^2\beta}{\alpha^2-\beta^2}\right]$ is equal to

(A) 0 (B) 1

(C) $\dfrac{\sin\beta}{\beta}$ (D) $\dfrac{\sin2\beta}{2\beta}$

18. If $f(x)=\dfrac{2-\sqrt{x+4}}{\sin2x}$, $(x\neq0)$, is continuous function at $x = 0$, then $f(0)$ is equal to

(A) $\dfrac{1}{4}$ (B) $-\dfrac{1}{4}$

(C) $\dfrac{1}{8}$ (D) $-\dfrac{1}{8}$

19. $\lim\limits_{x\to0}\dfrac{\log_e(1+x)}{3^x-1}$ is equal to

(A) $\log_e 3$ (B) 0

(C) 1 (D) $\log_3 e$

20. What is the value of $\lim\limits_{x\to0}\dfrac{\cos(ax)-\cos(bx)}{x^2}$

(A) $a-b$ (B) $a+b$

(C) $\dfrac{b^2-a^2}{2}$ (D) $\dfrac{b^2+a^2}{2}$

21. What is the value of $\lim\limits_{x\to\infty}\left(\dfrac{x+6}{x+1}\right)^{x+4}$?

(A) e (B) e^2

(C) e^4 (D) e^5

22. The value of $\lim\limits_{x\to0}\left[\dfrac{\sqrt{a+x}-\sqrt{a-x}}{x}\right]$ is

(A) 1 (B) 0

(C) $\sqrt{a}$ (D) $\dfrac{1}{\sqrt{a}}$

23. Let $f(x)=\begin{cases}\dfrac{\sin\pi x}{5x}, & x\neq0\\ k, & x=0\end{cases}$. If $f(x)$ is continuous at $x = 0$, then k is equal to

(A) $\dfrac{\pi}{5}$ (B) $\dfrac{5}{\pi}$

(C) 1 (D) 0

24. What is the value of $\lim\limits_{x\to0}\dfrac{\sin^2ax}{bx}$ (a and b are constants)?

(A) 0 (B) a

(C) $\dfrac{a^2}{b}$ (D) Does not exist

25. If $f(x)=\begin{cases}3x-4, & 0\le x\le2\\ 3x+\lambda, & 2\le x\le3\end{cases}$ is continuous at $x = 2$, then what is the value of λ?

(A) 1 (B) –1

(C) 2 (D) –2

26. What is the value of $\lim\limits_{x\to\infty}\left(\dfrac{x}{3+x}\right)^{3x}$?

(A) e (B) e^3

(C) e^{-9} (D) e^9