Multiple Choice Questions

1) The Taylor's series expansion of $f(x+h)$ in ascending powers of h is

A) $f(x)+hf'(x)+\frac{h^2}{2!}f''(x)+...$

C) $-f(x)-hf'(x)-\frac{h^2}{2!}f''(x)+...$

B) $f(0)+hf'(0)+\frac{h^2}{2!}f''(0)+...$

D) $f(x)-hf'(x)+\frac{h^2}{2!}f''(x)-\frac{h^3}{2!}f'''(x)+...$

2) The Taylor's series expansion of $f(x+h)$ in ascending powers of x is

A) $f(h)-xf'(h)+\frac{x^2}{2!}f''(h)-\frac{x^3}{3!}f'''(h)+...$

C) $f(x)+hf'(x)+\frac{h^2}{2!}f''(x)+...$

B) $f(0)+xf'(0)+\frac{x^2}{2!}f''(0)+...$

D) $f(h)+xf'(h)+\frac{x^2}{2!}f''(h)+...$

3) The Taylor's series expansion of $f(x+h)$ in ascending powers of h is

A) $f(a)+hf'(a)+\frac{h^2}{2!}f''(a)+...$

C) $f(0)+hf'(0)+\frac{h^2}{2!}f''(0)+...$

B) $f(h)+af'(h)+\frac{a^2}{2!}f''(h)+...$

D) $f(a)-hf'(a)+\frac{h^2}{2!}f''(a)-\frac{h^3}{2!}f'''(a)+...$

4) Expansion of $f(x)$ in ascending powers of $(x-a)$ by Taylor's theorem is

A) $f(x)+af'(x)+\frac{a^2}{2!}f''(x)+...$

B) $f(a)+(x-a)f'(a)+\frac{(x-a)^2}{2!}f''(a)+...$

C) $f(0)-(x-a)f'(0)+\frac{(x-a)^2}{2!}f''(0)-\frac{(x-a)^3}{3!}f'''(0)+...$

D) $f(a)-(x-a)f'(a)+\frac{(x-a)^2}{2!}f''(a)-\frac{(x-a)^3}{3!}f'''(a)+...$

5) Expansion of $\log(1+x)^x$ in ascending powers of x is

A) $x^2+\frac{x^3}{3}+\frac{x^4}{4}+\frac{x^5}{5}+...$

B) $x^2-\frac{x^3}{2!}+\frac{x^4}{3!}-\frac{x^5}{5!}+...$

C) $1+x+\frac{x^2}{2}-\frac{x^3}{3}+\frac{x^4}{4}-\frac{x^5}{5}+...$

D) $x^2-\frac{x^3}{2}+\frac{x^4}{3}-\frac{x^5}{4}+...$

6) Expansion of $\tan^{-1}x$ in ascending powers of x is

A) $x+\frac{x^3}{3!}+\frac{x^5}{5!}+...$

B) $x-\frac{x^3}{3!}+\frac{x^5}{5!}-...$

C) $x-\frac{x^3}{3}+\frac{x^5}{5}-...$

D) $x+\frac{x^3}{3}+\frac{x^5}{5}+...$

7) By using substitution $x=\tan\theta$ simplified form of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ is

A) $\tan^{-1}x$ B) $2\cot^{-1}x$ C) $2\tan^{-1}x$ D) none of these

8) The limit of the series $x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+...$ as x approaches to $\frac{\pi}{2}$ is

A) 0 B) $\frac{\pi}{2}$ C) 1 D) -1

9) First two terms in expansion of $\log(1+e^x)$ by Maclaurin's theorem is

A) $\log 2+\frac{x}{2}+...$ B) $\log 2-\frac{x}{2}+...$ C) $x-\frac{x^2}{2}+...$ D) $x+\frac{x^2}{2}+...$

10) First two terms in expansion of $e^x\sec x$ by Maclaurin's theorem is

A) $x+x^2+...$ B) $x-x^2+...$ C) $1+x+...$ D) $1+x+...$

11) Expansion of $\frac{1}{1-x}$ in ascending powers of x is

A) $-1-x-x^2-x^3-...$

B) $1+\frac{x^2}{2!}+\frac{x^4}{4!}+\frac{x^6}{6!}+...$

C) $1-x+x^2-x^3+...$

D) $1+x+x^2+x^3+...$

12) Expansion of $\frac{1}{1+x}$ in ascending powers of x is

A) $-1-x-x^2-x^3-...$

B) $1+\frac{x^2}{2!}+\frac{x^4}{4!}+\frac{x^6}{6!}+...$

C) $1-x+x^2-x^3+...$

D) $1+x+x^2+x^3+...$

13) Expansion of $\sinh x$ in ascending powers of x is

A) $1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\frac{x^4}{4!}+...$ C) $x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+...$

B) $1+\frac{x^2}{2!}+\frac{x^4}{4!}+\frac{x^6}{6!}+...$ D) $x+\frac{x^3}{3!}+\frac{x^5}{5!}+\frac{x^7}{7!}+...$

14) Expansion of $\cosh x$ in ascending powers of x is

A) $1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\frac{x^4}{4!}+...$ C) $x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+...$

B) $1+\frac{x^2}{2!}+\frac{x^4}{4!}+\frac{x^6}{6!}+...$ D) $x+\frac{x^3}{3!}+\frac{x^5}{5!}+\frac{x^7}{7!}+...$

15) The $f(x)$ and $g(x)$ be functions such that $f(a)=0$ and $g(a)=0$ then $\lim_{x\to a}\frac{f(x)}{g(x)}$ is equal to

A) $\lim_{x\to a}\frac{f'(x)}{g'(x)}$ B) $\lim_{x\to a}\frac{g'(x)}{f'(x)}$ C) $\frac{f(a)}{g(a)}$ D) none of these

16) The $f(x)$ and $g(x)$ be functions such that $f(a)=0, g(a)=0$ and $f'(a)=0, g'(a)=0$ then $\lim_{x\to a}\frac{f(x)}{g(x)}$ is equal to

A) $\lim_{x\to a}\frac{f'(x)}{g'(x)}$ B) $\lim_{x\to a}\frac{g'(x)}{f'(x)}$ C) $\frac{f'(a)}{g'(a)}$ D) none of these

17) $\lim_{x\to\frac{\pi}{2}}\frac{1-\sin x}{\cos x}$ is equal to

A) 1 B)0 C) $\frac{1}{2}$ D) -1

18) $\lim_{x\to 0}\frac{\sin x}{x}$ is equal to

A) 1 B) 0 C) 2 D) -1

19) $\lim_{x\to 0}\frac{\sin^{-1}x}{x}$ is equal to

A) 1 B) -1 C) $\frac{1}{2}$ D) $\frac{\pi}{2}$

20) $\lim_{x\to 0}(1+x)^{1/x}$ is equal to

A) 1 B) e^2 C) $\frac{1}{e}$ D) e

21) $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ is equal to

A) 1 B) e^2 C) $\frac{1}{e}$ D) e

22) $\lim_{x\to 0}\frac{e^x-1}{x}$ is equal to

A) 2 B) $\frac{1}{2}$ C) 1 D) -2

23) $\lim_{x\to 0}\frac{a^x-1}{x}$ is equal to

A) a B) $-\log a$ C) $\log a$ D) 1

24) $\lim_{\theta\to 0}\frac{\sin\left(\frac{\theta}{2}\right)}{\theta}$ is equal to

A) 1 B) 2 C) $\frac{1}{2}$ D) not defined

25) $\lim_{x\to 3}\frac{2x^2-7x+3}{5x^2-12x-9}$ is equal to

A) $-\frac{1}{3}$ B) $\frac{2}{5}$ C) $\frac{5}{18}$ D) 0

26) $\lim_{x\to 0}\frac{a^x-b^x}{x}$ is equal to

A) 0 B) 1 C) $\log\left(\frac{b}{a}\right)$ D) $\log\left(\frac{a}{b}\right)$

27) $\lim_{x\to 0}\frac{(1+x)^n-1}{x}$ is equal to

A) n B) 1 C) e D) 0

28) $\lim_{x\to 0}\frac{2^x-1}{\sqrt{1+x}-1}$ is equal to

A) $\log 2$ B) $\frac{1}{2}\log 2$ C) 0 D) $2\log 2$

29) $\lim_{x\to\infty}\frac{\log x}{x^n}$ is equal to

A) 2 B) -2 C) 1 D) 0

30) $\lim_{x\to\frac{\pi}{4}}\frac{1-\tan x}{1-\sqrt{2}\sin x}$ is equal to

A) 2 B) 0 C) 1 D) -2

31) $\lim_{x\to 0}\frac{a\sin 2x+\tan x}{x^3}$ is finite then value of a is equal to

A) -2 B) 2 C) $-\frac{1}{2}$ D) $\frac{1}{2}$

32) $\lim_{x\to\infty} \frac{\log(1+e^{3x})}{x}$ is equal to

A) 9 B) 3 C) $\frac{1}{3}$ D) 0

33) $\lim_{x\to 0} x\log x$ is equal to

A) 2 B) -1 C) 1 D) 0

34) $\lim_{x\to\infty} x\sin\left(\frac{1}{x}\right)$ is equal to

A) 2 B) 0 C) 1 D) -1

35) $\lim_{x\to 1} (1-x)\tan\left(\frac{\pi x}{2}\right)$ is equal to

A) $\frac{2}{\pi}$ B) $\frac{\pi}{2}$ C) π D) 0

36) $\lim_{x\to\frac{\pi}{2}} (1-\sin x)\tan x$ is equal to

A) 1 B) -1 C) π D) 0

37) $\lim_{x\to\frac{\pi}{2}} (\sec x - \tan x)$ is equal to

A) 1 B) -1 C) π D) 0

38) $\lim_{x\to\frac{\pi}{2}} \left(x\tan x - \frac{\pi}{2}\sec x\right)$ is equal to

A) 1 B) -1 C) π D) 0

39) The value of c in Lagrange's theorem for the function $f(x) = \log\sin x$ in the interval $\left[\frac{\pi}{6}, \frac{5\pi}{6}\right]$ is

A) $\frac{\pi}{4}$ B) $\frac{\pi}{2}$ C) $\frac{2\pi}{3}$ D) none of these

40) The value of c for which the conclusion of mean value theorem holds for the function $f(x) = \log_e x$ on the interval $[1, 3]$ is

A) $\frac{1}{2}\log_e 3$ B) $\log_e 3$ C) $\log_3 e$ D) $2\log_e 3$

41) If the function $f(x) = ax^3 + bx^2 + 11x - 6$ satisfies conditions of Rolle's theorem in $[1, 3]$ for $x = 2 + \frac{1}{\sqrt{3}}$, then values of a and b, respectively, are

A) -3, 2 B) 2, -4 C) 1, 6 D) none of these

42) The expansion of e^x is

A) $1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+...$ C) $1-x+\frac{x^2}{2!}-\frac{x^3}{3!}+...$

B) $x+\frac{x^2}{2!}+\frac{x^3}{3!}+...$ D) $1+x+x^2+x^3+...$

43) The infinite series $1-x+x^2-x^3+...$ is of

A) $\frac{1}{1+x}$ B) $\frac{1}{1-x}$ C) $\frac{1}{x-1}$ D) e^x

44) The geometrical meaning of Lagrange's mean value theorem is that the tangent at point $c\in(a,b)$ is

A) Perpendicular to chord AB C) Intersecting to chord AB

B) Parallel to chord AB D) none of these

45) Rolle's theorem is not applicable for the function $f(x)=|x|$ in $[-2,2]$ since

A) $f(x)$ is not continuous at $x=-2$ C) $f(x)$ is not continuous at $x=0$

B) $f(x)$ is not continuous at $x=2$ D) $f(x)$ is not differential at $x=0$

46) The infinite series $x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+...$ converges to

A) $\tan x$ B) $\sin x$ C) $\cos x$ D) e^x

47) Rolle's theorem is not applicable for the function $f(x)=x^2$ in $[0,2]$ since

A) $f(x)$ is not continuous in $[0,2]$ C) $f(x)$ is not continuous in $[0,2]$

B) $f(0)\neq f(2)$ D) none of these

48) The geometrical meaning of Rolle's theorem is that the tangent at point $c\in(a,b)$ is

A) Parallel to y axis C) intersecting to x and y axis

B) Parallel to x axis D) none of these

49) If a function $f(x)$ satisfies conditions of Lagrange's mean value theorem for the interval $[a,b]$ and if $f'(c)=0$ for every $c\in(a,b)$ then function $f(x)$ is

A) A constant function C) decreasing function

B) Increasing function D) none of these

50) From Cauchy's mean value theorem , we can obtain Lagrange's mean value theorem by taking $g(x)=...$ for all $x\in[a,b]$.

A) $\sin x$ B) x C) e^x D) $\cos x$

51) If f(x) satisfies all conditions of Rolle's mean value theorem in $[a,b]$ then there exists a point $c\in(a,b)$ such that

A) $f(a)=f(b)$ C) $f'(c)>0$

B) $f'(c)=\dfrac{f(b)-f(a)}{b-a}$

D) $f'(c)=0$

52) Rolle's theorem is not applicable for the function $f(x)=\sin x$ in $\left[0,\dfrac{\pi}{2}\right]$ since

A) $f(x)$ is not continuous at $x=0$

C) $f(x)$ is not differential at $x=0$

B) $f(0)\neq f\left(\dfrac{\pi}{2}\right)$

D) $f(x)$ is not continuous in $\left[0,\dfrac{\pi}{2}\right]$

LIMIT AND CONTINUITY

1) The function $f(x)=|x|$ is continuous at x=0 and it is …………
   a) Differential at x=0
   b) Not Differential at x=0
   c) Integrable at x=0
   d) None of these
2) If f is continuous at x=a if ……………..
   a) $\lim_{x\to a^-} f(x) = \lim_{x\to a^+} f(x)$
   b) $\lim_{x\to a^-} f(x) = f(a)$
   c) $\lim_{x\to a^+} f(x) = f(a)$
   d) $\lim_{x\to a^-} f(x) = \lim_{x\to a^+} f(x) = f(a)$
3) $\lim_{X\to 0} \frac{1-cosx}{x^2} = \cdots$ ... ...

   a) 1   b) ½   c) 0   d) -1/2
4) Continuity is ……………. Condition for existence of a derivative.
   a) Necessary but not sufficient
   b) Sufficient but not necessary
   c) Both necessary and sufficient
   d) Neither necessary nor sufficient
5) The function $f(x)=\frac{x-|x|}{2}$ $,when\ x\neq 0$ and f(0) = 2 is ……….

   a) continuous at x=0

   c) continuous at $x\neq 0$

   b) discontinuous at x=0

   d) oscillatory
6) Function f is continuous at x = c if statement $|f(x)-f(c)|<\epsilon$ $,\forall\ x$ whenever $|x-c|\ <\delta$ is true where …………..

   A) $\in>0\,,\delta>0$

   C) $\in<0\,,\delta<0$

   B) $\in>0,\delta<0$

   D) $\in<0,\delta>0$

a)

7) If δ depends on both $\in$ and value of x we say that continuity is ………..

a) Point wise continuity c) uniform continuous

b) Discontinuous d) none of these

8) If $\lim_{x\to a^-} f(x)$ and $\lim_{x\to a^+} f(x)$ both do not exist then the discontinuity is called the discontinuity of ……………..

a) First kind c) second kind

b) Third kind d) mixed kind

9) A uniformly continuous function is ……………

a) Not continuous c) continuous

b) Differentiable d) not differentiable

10) If f is differentiable at x = a then ……………

a) F is discontinuous at x = a c) $f(a) = \infty$

b) F is continuous at x = a d) $f(a) = 4$

11) $\lim_{X\to 0} \frac{1-cosx}{x^2} = \cdots \dots \dots \dots$

b) 1 b) ½ c) 0 d) -1/2

12) $\lim_{X\to \pi} \frac{1+cosx}{(\pi-x)^2} = \cdots \dots \dots \dots$

c) 1/4 b) 1 c) 0 d) 1/2

13) A continuous function defined on a closed bounded interval is ………

a) uniformly continuous c) unbounded

b) not continuous d) bounded

14) If f(x) is continuous in the closed interval [a , b] and f(x) vanished for some value of x in (a,b) when …………..

a) f(a).f(b) is positive c) f(a).f(b) is negative

b) f(a).f(b) = 1 d) f(a).f(b) = 0

15) $\lim_{x\to 0} xsin(\frac{1}{x}) = \cdots \dots \dots ..$

a) 0 b) 1 c) ∞ d) does not exist

16) The function $f(x) = \frac{|x|}{x}$ $, when\ x \neq 0\ then\ f(0) = 0\ is \dots \dots \dots \dots$

a) continuous at x=0 c) Not continuous in (0 , ∞)

b) not continuous at x=0 d) Not continuous in ($-\infty$, 0)

17) An example of a function which is continuous at x = 0 but not differentiable at is …………..

a) F(x) = log x b) f(x) = e^x c) f(x) = x d) f(x) = $|x|$

18) $\lim_{X\to 0} \frac{1-x^2}{logcosx} = \cdots \dots \dots \dots$

d) 4 b) -4 c) -2 d) 2

19) Function f has limit Ɩ $as\ x \to a$ if for given $\in > 0$, there exists $\delta > 0$ such that $|f(x) - Ɩ\,| < \epsilon$ when …………

a) $x - a < \delta$ $c) - (x - a) < \delta$

b) $|x+a|<\delta$ d) $0<|x-a|<\delta$

20) $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ = ……………..

a) 0 b) 1 c) e d) ∞

21) F(x) is not continuous at x = 0 means …………..

a) $\lim_{x\to 0} f(x) = f(0)$
b) $\lim_{x\to 0^+} f(x) = \lim_{x\to 0^-} f(x)$
c) $\lim_{x\to 0} f(x) = finite$
d) $\lim_{x\to 0^+} f(x) \neq \lim_{x\to 0^-} f(x)$

22) The function $f(x) = \frac{x-|x|}{|x|}$ $, when\ x \neq 0$ and f(0) = 2 is ………..

c) continuous at x=0 c) continuous at $x = 0$
d) discontinuous at x=0 d) none of them

23) $\lim_{x\to\infty}\frac{1}{x+a}$ = ……………..

a) 1 b) a c) 0 d) not determined

24) … function defined on a closed bounded interval is bounded.

a) Differentiable c) Integrable
b) Continuous d) discontinuous

25) A continuous function defined on a closed, bounded interval is …….

a) Uniformly continuous c) not bounded
b) Not uniformly continuous d) none of these

26) In the continuity of f(x , y), the point (x , y) can approach to (a , b) along ……………..

a) Only one path
b) In two directions either from right to left
c) Infinite paths
d) none of these

27) The function $f(x) = \frac{x}{|x|}$ $, when\ x \neq 0\ and\ f(0) = 0\ is$ … … … …

a) continuous at x=0 b) Not continuous in (0 , ∞)
c) not continuous at x=0 d) Not continuous in (−∞ , 0)

28) Right hand limit of $\lim_{x\to 0}\frac{e^{1/x}}{e^{1/x}+1}$ is …..

A) 0 B) 1 C) ∞ D) $-\infty$

29) Left hand limit of $\lim_{x\to 0}\frac{e^{1/x}}{e^{1/x}+1}$ is …..

A) 0 B) 1 C) ∞ D) $-\infty$

30) Left hand limit of $f(x) = 2x^2 - 1$ for $0 \le x \le 2$

$= 4x + 1$ for $2 < x \le 4$

As $x \to 2$ is ……

A) 7 B) 9 C) none D) -1

31) Right hand limit of $f(x) = 4x + 1$ for $0 \le x \le 1$

$$= 2x^2 - 1 \text{ for } 1 \le x \le 2$$

as $x \to 1$ is ……

A) 5 B) 3 C) none D) -1

32) If $f(x) = x \sin \frac{1}{x}$ is continuous at $x = 0$ then $f(0)$ is ….

A) 0 B) 1 C) $\frac{\pi}{2}$ D) none

33) If $f(x) = \dfrac{x-1}{1 + e^{\frac{1}{x-1}}}$ is continuous at $x = 1$ then $f(1)$ is ….

A) 0 B) ∞ C) $-\infty$ D) none

34) If $f(x) = \dfrac{\sin^2 ax}{x^2}$ for $x \ne 0$ and $f(0) = 1$ then $f(x)$ is … at $x = 0$

A) Discontinuous
B) non removable discontinuous
B) Continuous
D) none

35) If $f(x) = |x|$ then $f(x)$ is …. at $x = 0$

A) Continuous
B) derivable
B) Discontinuous
D) none

36) If $f(x) = -x^2$ for $x \le 1$ and $f(x) = x^2$ for $x > 1$ then $f(x)$ has ….

A) Discontinuity of first kind
B) Discontinuity of second kind
B) Removable discontinuity
D) none

37) The function $f(x) = |x|$ is ….

A) Continuous for all x
B) Continuous for all $x = 0$ only
C) discontinuous for all $x = 0$ only
D) discontinuous for all x

38) The function $f(x) = 1 + x$; if $x \le 2$ is …..

$$= 5 - x; \text{ if } x > 2$$

A) Continuous for all values of x
B) Continuous for all values of x except $x = 2$
C) discontinuous at $x = 0$
D) discontinuous at $x = 2$

39) Which of the following is continuous at $x = 0$?

A) $f(x) = \frac{1}{x}$

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

C) $f(x) = \frac{|x|}{x}$

D) $f(x) = \frac{x}{|x|}$