1. $\lim_{x\to 0}\left(\frac{\sin x}{x(1+\cos x)}\right)$ is equal to

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

2. $\lim_{x\to 0}\frac{|x|}{x}$ is equal to :

(A) 1

(B) -1

(C) 0

(D) Does not exist

3. $\lim_{x\to 0}\frac{\sin x}{\sqrt{x+1}-\sqrt{1-x}}$ is :

(A) 2

(B) 0

(C) 1

(D) -1.

4. Let $f(x)=\begin{Bmatrix} x^2-1, 0<x<2 \\ 2x+3, 2\leq x<3 \end{Bmatrix}$, the quadratic equation whose roots are $\lim_{x\to 2^-} f(x)$ and $\lim_{x\to 2^+} f(x)$ is :

(A) $x^2-6x+9=0$

(B) $x^2-7x+8=0$

(C) $x^2-14x+49=0$

(D) $x^2-10x+21=0$

5. $\lim_{x\to 0}\frac{\tan 2x-x}{3x-\sin x}$, is :

(A) 1

(B) $\frac{1}{2}$

(C) - $\frac{1}{2}$

(D) $\frac{1}{4}$.

6. $\lim_{x\to\infty} \frac{(2x-3)(3x-4)}{(4x-5)(5x-6)}$equals :

(A) 0

(B) $\frac{1}{10}$

(C) $\frac{1}{5}$

(D) $\frac{3}{10}$

7. $\lim_{x \to \infty} \left[\frac{x+6}{x+1}\right]^{x+4}$ is :

(A) 0

(B) 1

(C) e^4

(D)e^5.

8. If f be a function such that $f(9) = 9$ and $f(9) = 3$, then :

$\lim_{x \to 9} \frac{\sqrt{f(x)}-3}{\sqrt{x}-3}$is :

(A) 1

(B) 9

(C) 3

(D) None of these

9. $\lim_{x\to\infty}\left[\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\cdots+\frac{1}{n(n+1)}\right]$is :

(A) 1

(B) $\frac{2}{3}$

(C) $\frac{1}{3}$

(D) 0.

10. If *a, b, c, d* are + ve, then :

$\lim_{x\to\infty}\left[1+\frac{1}{a+bx}\right]^{c+dx}$ is equal to :

(A) *e*

(B) $e^{(c+d)(a+b)}$

(C) $e^{d/b}$

(D) $e^{c/a}$

11. The value of constants *a* and *b*, so that :

$\lim_{x\to\infty}\left[\frac{x^2+1}{x+1}-ax-b\right]=0$,is

(A) *a* = 0, *b* = 0

(B) *a* = 1, *b* = -1

(C) *a*= - 1, *b*= -1

(D) *a* = 2, b = -1.

12. $\lim_{x\to\infty}\frac{\sqrt{x^2+1}-\sqrt[3]{3^3+1}}{\sqrt[4]{x^4+1}-\sqrt[5]{x^4+1}}$equals :

(A) -1

(B) 0

(C) -1

(D) None of these

13.*f(x)* = $\frac{\sqrt{1+px}-\sqrt{1-px}}{x}$, -1 ≤*x*≤ 0

= $\frac{2x+1}{x-x}$, $0 \leq x \leq 1$ is continuous in the interval $[-1,1]$, then *p*is :

(A) -1

(B) - $\frac{1}{2}$

(C) $\frac{1}{2}$

(D) 1.

14.If*f(x)* $\frac{2-(256-7x)^{\frac{1}{8}}}{(5x+32)^{\frac{1}{5}}-2}$, $x = 0$, then for f to be continuous everywhere, $f(0) is\ equal\ to$:

(A) 2^4

(B) 1

(C) -1

(D) None of these

15. Let *f(x)* = $\begin{cases} \frac{\sqrt{1+ax}-\sqrt{1-ax}}{x} : -1 \leq x < 0 \\ \frac{2x+1}{x-2} : \quad : \quad 0 \leq x \leq 1 \end{cases}$

is continuous in $[-1,1]$. Then *a* equals :

(A) 1

(B) $\frac{1}{2}$

(C) - $\frac{1}{2}$

16. $\lim_{x\to\infty} \frac{(2+x)^{40}\,(4+x)^{5}}{(2+x)^{45}}$ is :

(A) -1

(B) 1

(C) 16

(D) 32.

17. $\lim_{n\to\infty} \frac{\log 1+x+x^2+\log(1-x-x^2)}{\sec x-\cos x}$ is equal to :

(A) 2

(B) 1

(C) 0

(D) does not exist

18. $\lim_{x\to 0} \frac{\log_{\sec x/2} \cos x}{\log_{\sec x} \cos x/2}$ is equal to :

(A) 2

(B) 4

(C) 8

(D)16.

19.$\lim_{x\to 0} \quad \left[\int_y^a e^{sin^2 t}\, dt - \int_{x+y}^a e^{sin^2 t}\, dt\right] + x$ is equal to :

(A) $e^{sin^2 y}$

(B) Sin 2 $y\, e^{sin^2 y}$

(C) 0

(D) None of these.

20. The value of $\lim_{x \to 0} \frac{\int_0^{x^2} \cos t^2 \, dt}{x \sin x}$ is :

(A) $\frac{3}{2}$

(B) 1

(C) -1

(D) None of these

21. $\lim_{x \to \infty} \frac{\int_0^{2x} se^2 \, dx}{e^{4x^2}}$ equals :

(A) 0
(B) ∞
(C) 2
(D) $\frac{1}{2}$

22. $\lim_{x \to 2} \left(\frac{[x]^2}{3} - \left[\frac{x}{3} \right]^2 \right)$ equals :

a) 0
b) $\frac{1}{3}$
c) $\frac{64}{27}$
d) None of these

23. Let $f(x) = \begin{cases} \frac{g(x)-g(a)}{x-a} & x \neq 0 \\ g'(a), & x = a \end{cases}$ where g is a function derivable at $x = a$, then at $x = a$:

(A) f is continuous only if $g'(a) = 0$

(B) f is continuous

(C) f is continuous only if $\boldsymbol{\lambda} = 0$

(D) None of these.

24. Let $f(x) = \begin{cases} 1, & x \leq -1 \\ |x| - 1 & -1 < x < 1 \\ 0 & x \geq 1 \end{cases}$ then :

A) f is continuous at x = -1

B) f is differentiable at x = - 1

C) f is continuous everywhere

D) f is differentiable for all x.

25. The function of $f(x) = [x]$ is :

(A) Discontinuous only for integral *x*

(B) A constant function

(C) Continuous for all *x*

(D) Derivable for all *x*.

26. Let $f(x) = \frac{1-\sin x}{(\pi-2x)^2}$, when $x \neq \pi/2$ and $f(\pi/2) = k$,

The value of *k* which makes *f* continuous at $\pi/2$is :

(A) 1/8

(B) ¼

(C) ½

(D) None of these

27. Let $f(x) = \begin{cases} \frac{x^2}{a}, & 0 \leq x < 1 \\ a & 1 \leq x < \sqrt{2} \\ \frac{2b^2-4b}{x^2} & \sqrt{2} \leq x \end{cases}$

be continuous in [0, ∞), then the most suitable values of a and b are :

A) *a = - 1, b – 1*

B) *a=1, b = - 1*

C) *a = -1, b = 1 +*$\sqrt{2}$

D) None of these.

28. The value of *f*(0) so that the function :

$f(x) = \frac{\sqrt{1+x} - (1+x)^2}{x}$ becomes continuous, is equal to :

(A) $\frac{1}{3}$

(B) 2

(C) $\frac{1}{6}$

(D) $\frac{1}{4}$.

29. The value *x*, where the function :

$f(x) = \frac{\tan x \log(x-2)}{x^2-4x+3}$

(A) -∞

(B) (-∞, 2) ∪ (3)

(C) (- ∞, 2) $\left\{3, \pi\pi + \frac{\pi}{2}, \mathrm{n} \geq 1\right\}$

(D) None of these.

30. The value of *f* (0) for which the function :

$\frac{\log_e(1-ax)-\log_3 1-bx}{x}$ is

(A) *b* – *a*

(B) *a* + *b*

(C) – (*a* + *b*)

(D) *a* – *b*

31. If *f* (*x*) = [*x*] + [- *x*] ,*x* ≠ 2
= **λ**, *x* = 2.
then*f* is continuous at *x* = 2, provided **λ** is equal to :

(A) 2

(B) -1

(C) 1

(D) 0.

33. Let $f(x)$ be defined by $f(x) = \begin{cases} \frac{|x^2-x|}{x^2-x}, & x \neq 0,1 \\ 1. & x = 0 \\ -1. & x = 1. \end{cases}$

Then $f(x)$ is continuous for all :

(A) x

(B) x except at $x = 0$

(C) x except at $x = 1$

(D) x except at $x = 0$ and $x = 1$.

34. $\lim_{x\to 0} \frac{\log(3+x) - \log(3-x)}{x} = k$, the value of k is :

(A)- $\frac{3}{2}$

(B)$\frac{2}{3}$

(C)- $\frac{2}{3}$

(D) 0.

35. The value of $\lim_{x \to 0} \frac{\int_0^{x^2} sec^2\, t\, dt}{x \sin x}$is :

(A) 2

(B) 1

(C) 0

(D) 3.

36. The value of p and q for which the function :

$f(x) = \begin{cases} \frac{\sin(p+1)x + \sin x}{x}, & x < 0 \\ q, & x = 0 \\ \frac{\sqrt{x+x^2} - \sqrt{x}}{x^{3/2}}, & x > 0 \end{cases}$is :

continuous for all x in **R**, are :

(A) $p = \frac{1}{2}$, $q = -\frac{3}{2}$

(B) $p = \frac{5}{2}$, $q = \frac{1}{2}$

(C) $p = -\frac{3}{2}$, $q = \frac{1}{2}$

(D) $p = \frac{1}{2}$, $q = \frac{3}{2}$.

37. $\lim_{x \to 0} \frac{(1-\cos 2x)(3+\cos x)}{x \tan 4x}$ is equal to "

(A) $\frac{1}{2}$

(B) 1

(C) 2

(D) $-\frac{1}{4}$

38. If $f(x) = \begin{cases} \frac{3 \sin \pi x}{5y} \\ 2k \end{cases}$, $x \neq 0$ is common at $x = 0$. $x=0$

then the value of k is equal to :

(A) $\frac{3\pi}{10}$

(B) $\frac{3\pi}{5}$

(C) $\frac{\pi}{10}$

(D) $\frac{3\pi}{2}$

39. If the function f(x) satisfies $\lim_{x \to 1} \frac{f(x)-2}{x^2-1} = \pi$

then $\lim_{x \to 1} f(x) =$

(A) 2
(B) 3
(C) 1
(D) 0
(E)

40. If $\lim_{x \to \infty} \frac{(1^2+2^2 \ldots\ldots+n^2)\ (n)^{1/n}}{(n+1)(n+10)(n+100)} =$

(A) 3

(B) $\frac{1}{3}$

(C) $\frac{2}{3}$

(D) ∞

41. $\lim_{x \to 0} \frac{1-\cos x}{x^2}$ is:

(A) 2
(B) 3
(C) $\frac{1}{2}$
(D) $\frac{1}{3}$

42. The function of $f(x) = [x]$, where $[x]$ denotes greatest integer function is not continuous at:

(A) 4
(B) -2
(C) 1
(D) 1.5

43. $f(x) = \begin{cases} 3x-8 & \text{if } x \leq 5 \\ 2k, & \text{if } x < 5 \end{cases}$ is continuous, find *k*.

(A) $\frac{2}{7}$
(B) $\frac{3}{7}$
(C) $\frac{4}{7}$
(D) $\frac{7}{2}$

44. For a real number *x* let [*x*] denote the greatest integer less than or equal to *x*. Then *f* (*x*) = $\frac{\tan(\pi[x-\pi])}{1+[x]^2}$ is :

(A) continuous at some *x*

(B) continuous at all *x* but *f* (*x*) does not exist

(C) $f(x)$ exists for all x, but $f'(x)$ does not exist

(D) $f(x)$ exists for all x.

45. Every continuous function is :

(A) differentiable

(B) increasing

(C) decreasing

(D) not differentiable

46. Let $f(x) = \begin{cases} x^2, x \geq 0 \\ -x^2, x < 0 \end{cases}$, then :

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

(B) $f(x)$ is derivable at $x = 0$

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

(D) $f(x)$ is continuous but not derivable at $x = 0$.

47. The function $f(x) = 1 + |\sin x|$ is :

(A) differentiable everywhere

(B) differentiable nowhere

(C) continuous everywhere

(D) continuous nowhere.

48. At the point, $x = 1$, the function :

$f(x) = x^3 - 1, 1 < x < \infty$

$= x - 1, -\infty < x \leq \infty$

(A) discontinuous and not differentiable

(B) continuous and differentiable

(C) continuous and not differentiable

(D) discontinuous and differentiable.

49. $g(x) = xf(x)$, where $f(x) = x\sin\frac{1}{x}, x \neq 0$
= 0, $x = 0$.
At x=0:

(A) g is differentiable but g' is continuous

(B) g is differentiable but g' is not continuous

(C) g is differentiable while f is not continuous

(D) both f and g are differentiable

50. If $y = \frac{\sin(x+9)}{\cos x}$, then $\frac{dy}{dx}$ at $x = 0$ is:

(A) cos 9
(B) sin 9
(C) 0
(D) 1

51. If $f(x) = 1 + x + \frac{x^2}{2} + \cdots + \frac{x^{100}}{100}$, then $f'(1)$ is equal to :

(A) $\frac{1}{100}$

(B) 100

(C) Does not exist

(D) 0.

52. If $u = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ and $v = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$, then $\frac{du}{dv}$is :

(A) $\frac{1}{2}$

(B) x

(C) $\frac{1-x^2}{1+x^2}$

(D) 1.

53. If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \cdots \ldots \ldots \text{to } \infty}}}$, then the value of $\frac{dy}{dx}$ is equal to :

(A) $\sqrt{\frac{\sin x}{y+1}}$

(B) $\frac{\sin x}{y+1}$

(C) $\frac{\cos x}{2y+1}$

(D) $\frac{\cos x}{2y-1}$.

54. If $y=x^{x^{x^{\cdots\cdots\infty}}}$, then $x\frac{dy}{dx}$equals :

(A) $\frac{x(1-y\ \log x)}{y^2}$

(B) $\frac{y^2}{x(1-y\log x)}$

(C) $\frac{y^2}{1-y\log x}$

(D) None of these

55. If $y = \sin(\sin x)$ and $\frac{d^2y}{dx^2} + \frac{dy}{dx}\tan x + f(x) = 0$, then

f(x) equals to :

(A) $\sin^2 x \sin(\cos x)$

(B) $\sin^2 x \cos(\sin x)$

(C) $\cos^2 x \sin(\cos x)$

(D) $\cos^2 x \sin(\sin x)$

56. If $y - a\, e^{ms} + be^{-ms}$ then y_2 is:

(A) $-m^2y$
(B) my_1
(C) m^2y
(D) None of these

57. If $\sqrt{x+y} + \sqrt{y-x} = c$ then $\frac{d^2y}{dx^2}$ is equal to :

(A) $\frac{2}{c^2}$

$$(B)\frac{2}{c}$$

(C)- $\frac{2}{c^2}$

(D) None of these.

58. If $y = x + e^x$, then $\frac{d^2x}{dy^2}$is :

(A) $\frac{1}{(1+e^2)^2}$

(B) $\frac{e^x}{(1+e^x)^2}$

(C) $-\frac{e^x}{(1+e^c)^3}$

(D) e^x.

59. Let $f(2) = 4$ and $f(2) = 4$.
Then $\lim_{x\to 2} \frac{xf(2)-2f(x)}{x-2}$ is given by :

(A) 2

(B) -2

(C) -4

(D) 3.

60. If $y = (x + \sqrt{1+x^2})^n$, then $(1 + x^2)\ \frac{d^2y}{dx^2} + x\ \frac{dy}{dx}$ is :

(A) a^2y

(B) $-n^2y$

(C) – y

(D) $2x^2y$.

61. If $f(x) = \int_{-1}^{x} |t|\, dt, x \geq -1$ then :

(A) f and f are continuous for $x + 1 > 0$

(B) f is continuous but f is not so for $x + 1 > 0$

(C) f and f are continuous at $x = 0$

(D) f is continuous at $x = 0$ but f is not so.

62. If $x \sin y + y\cos x = \pi$, then the value of $y''(10)$ is :

(A) π

(B) $-\pi$

(C) 1

(D) 0.

63. Let **R → R** be a function defined by :
$f(x) = \text{Min.}\{x + 1, |x| + 1,$
Then which of the following is true?

(A) $f(x)$ is not differentiable at $x = 1$

(B) $f(x)$ is differentiable everywhere

(C) $f(x)$ is not differentiable at $x = 1$

(D) $f(x) \geq 1$ for all $x \in \mathbf{R}$.

64. If g is the inverse of a function f and $f'(x) = \frac{1}{1+x^2}$.

(A) $5x^4$

(B) $\frac{1}{1+\{g(x)\}^5}$

(C) $1 + \{g(x)\}^5$

(D) $1 + x^5$

65. $\frac{d}{dx}\left[cos^2\left(\cot^{-1}\sqrt{\frac{2+x}{2-x}}\right)\right]$is :

(A) $\frac{1}{2}$

(B) $\frac{1}{2}$

(C)-$\frac{1}{2}$

(D) $\frac{-3}{4}$.

66. If $f(x) = \frac{\sin^2 x}{1+\cot x} + \frac{\cos^2 x}{1+\tan x}$, then $f\left(\frac{\pi}{4}\right)$is :

(A) $\sqrt{3}$

(B) $\frac{1}{\sqrt{3}}$

(C) $-\frac{1}{2}$

(D) $\frac{-3}{4}$

67. If $\cos^{-1}\left(\frac{y}{b}\right) = n\log\left(\frac{x}{n}\right)$, then:

(A) $y_1 = x\sqrt{b^2 - y^2}$

(B) $xy_1 - \sqrt{b^2 - y^2}$ =0

(C)$xy_1 - n\sqrt{b^2 - y^2}$

(D)$xy_1 + n\sqrt{b^2 - y^2}$ =0.

68. If $f(x) = \begin{cases} 2a - x \text{ when } -a \leq x < a \\ 3x - 2a \quad \text{when } a \leq x. \end{cases}$

(A) $f(x)$ is not differentiable at $x = a$

(B) $f(x)$ is continuous at $x = a$

(C) $f(x)$ is continuous for all $x < a$

(D) $f(x)$ is differentiable for all $x \geq a$.

69. If $y = (1 + x)(1 + x^2)(1 + x^4)$, then $\frac{dy}{dx}$ at $x = 1$ is :

(A) 28

(B) 0

(C) 20

(D) 1.

70. If $y = (\tan^{-1}x)^2$, then $(x^2 + 1)y_2 + 2\,x\,(x^2 + 1)y_1$ is equal to :

(A) 0

(B) 1

(C) 4

(D) 2.

71. If $f(x)$ is defined by:

$f(x) = \frac{x^{100}}{100} + \frac{x^{99}}{99} + \cdots \ldots \ldots \ldots \ldots + \frac{x^2}{2} + 1,$

then f' (0) =

(A) 100

(B) -1

(C) 100 f '(0)

(D) 1.

72. Which of the following functions is differentiable at $x = 0$?

(A) $\cos(|x|) + |x|$
(B) $\cos(|x|) - |x|$
(C) $\sin(|x|) + |x|$
(D) $\sin(|x|) - |x|$

73. If $x = a(\cos t + \log \tan t/2), y = a \sin t$, then $\frac{dy}{dx} =$

(A) tan*t*

(B) cot*t*

(C) – cot *t*

(D) – tan *t.*

74. If $f(x) = \tan^{-1}x$, then $\lim_{x \to 1} \frac{f(x)-f(1)}{x-1} =$

(A) $\frac{\pi+3}{4}$

(B) $\frac{x}{4}$

(C) $\frac{\pi+1}{4}$

(D) $\frac{\pi+2}{4}$

75. If $f(y) = f(x^2 + 2)$ and $f'(y) = 5$, then $\frac{dy}{dx}$ at $x = 1$ is

(A) 5

(B) 25

(C) 15

(D) 10.

76. If $x = a\cos^3\theta, y = a\sin^3\theta, then\ 1 + \left(\frac{dy}{dx}\right)^2$ is :

(A) tan θ

(B) $\tan^2\theta$

(C) $\sec^2\theta$

(D) 1

77. If the function $g(x)$ is defined by:

$g(x) = \frac{x^{200}}{200} + \frac{x^{199}}{199} + \frac{x^{198}}{198} + \cdots \ldots \ldots + \frac{x^2}{2} + x + 5,$

then g ' (0) =

(A) 1

(B) 200

(C) 100

(D) 5.

78. If $f(x) = 2x^2$, find $\frac{f(3.8-f(4)}{3.8-4}$:

(A) 1.56

(B) 156

(C) 15.6

(D) 0.156.

79. If $x = ct$ and $y = \frac{c}{t}$, find $\frac{dy}{dx}$ at $t = 2$:

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

80. If $y = \log\left(\frac{1-x^2}{1+x^2}\right)$, then $\frac{dy}{dx}$ is equal to:

(A) $\frac{-4x}{1-x^4}$

(B) $\frac{4x^2}{1-x^4}$

(C) $\frac{1}{4-x^4}$

(D) $\frac{4x^3}{4-x^4}$