

CONTINUITY AND DIFFERENTIATION

1. State the function which is continuous for all $x \in \mathbb{R}$.
(a) $\sin x$ (b) $(x^2-25)/(x-5)$
(c) $[x]$ (d) $\text{sgn}(x)$
2. The function 'f' defined by $f(x) = (x^3-8)/(x-2)$, $x \neq 2$ is 12, $x=2$
(a) not continuous at $x = 2$
(b) continuous at $x = 2$
(c) not continuous at $x = 3$
(d) not continuous at $x = -2$
3. If $x = at^2$, $y = 2at$, then d^2y/dx^2 is
(a) $1/t$ (b) $-1/t^3$
(c) at^2 (d) $-1/(2at^3)$
4. Derivative of $(x/2)\sqrt{a^2-x^2} + (a^2/2)\sin^{-1}(x/a)$, with respect to x , is
(a) $\sin^{-1}(x/a)$ (b) $(x/2)\sqrt{a^2-x^2}$
(c) $\sqrt{a^2-x^2}$ (d) $1/\sqrt{a^2-x^2}$
5. Discuss the applicability of LMV Theorem for the function $f(x) = |x|$, in $[-1, 1]$
(a) applicable, $c = 0$ (b) applicable, $c = -1$
(c) applicable, $c = 1$ (d) not applicable

Differentiate each of the following with respect to x

(Exercises 6 to 10):

6. $\sin \log x$
7. $\cos^{-1}\sqrt{x}$
8. $e^{-1/x}$
9. $\sin[\log(x^2-1)]$
10. $\log_e(\sin x)$
11. Differentiate $\cos x$ with respect to e^x .
12. If $y = \sec^{-1}(\sqrt{(x+1) / \sqrt{(x-1))} + \sin^{-1}(\sqrt{(x-1) / \sqrt{(x+1))})$, find dy/dx
13. Given $f(0) = -2$, $f'(0) = 3$. Find $h'(0)$, where $h(x) = xf(x)$.
14. Find dy/dx at $(4, 9)$, when $\sqrt{x} + \sqrt{y} = 5$.
15. Find the second derivative of $\log x$ with respect to x .

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[CLASS XII]

16. Show that the function $f(x) = \sin x / |x|$ is discontinuous at $x = 0$.

17. Show that the function $f(x) = |x| - x$ is continuous at $x = 0$

18. Let f be the function defined as

$$f(x) = \left\{ \begin{array}{l} 2x / [\sqrt{a+x} - \sqrt{a-x}], \text{ if } x \neq 0 \\ 3k, \text{ if } x = 0 \end{array} \right\}, a > 0.$$

For what value of k , function is continuous at $x = 0$?

19. A function f is defined as

$$f(x) = \left\{ \begin{array}{l} (1 - \cos 4x) / x^2, \text{ if } x < 0 \\ x / (\sqrt{16 + \sqrt{x}} - 4), \text{ if } x > 0 \end{array} \right\}$$

Is the function continuous at $x = 0$? If not how should the function be defined at $x = 0$, so that the function is continuous at $x = 0$?

20. If a function f defined as

$$f(x) = \left\{ \begin{array}{l} \sin(a+1)x + \sin x / x^2, \text{ if } x < 0 \\ c, \text{ if } x = 0 \\ x / (x + bx^2 - x), \text{ if } x > 0 \end{array} \right\}$$

is continuous at $x = 0$. Find the values of a , b and c .

21. Let f be the function defined as

$$f(x) = \left\{ \begin{array}{l} (\cos^2 x - \sin^2 x - 1) / \sqrt{x+1} - 1, \text{ if } x \neq 0 \\ k, \text{ if } x = 0 \end{array} \right\}$$

is continuous at $x = 0$. Find the value of k .

22. Let f be the function defined as

$$f(x) = \log(1 + 3x) - \log(1 - 5x) / 2x, \text{ if } x \neq 0 \quad k, \text{ if } x = 0$$

is continuous at $x = 0$. Find the value of k .

23. Show that the function $f(x) =$

$$x / |x| + x^2, \text{ if } x \neq 0 \quad k, \text{ if } x = 0$$

is discontinuous at $x = 0$ whatever may be the value of k .

24. Examine the continuity of the function

$$f(x) = |x| \cos 1/x, \text{ if } x \neq 0 \quad 0, \text{ if } x = 0$$

at $x = 0$.

25. Let f be the function defined as $f(x) = e^{(1/x-1)}$, if $x \neq 0$

0 , if $x = 0$

Show that function is discontinuous at $x = 0$.

26. Let f be the function defined as

$$f(x) = x^2 + 2 - 16 / x^4 - 16, \text{ if } x \neq 2$$

k , if $x = 2$

be continuous at $x = 2$.

Find the value of k .

27. For what value of k , the function $f(x) = \sin 3x / \tan 2x$, if $x < 0$

k , if $x = 0$ is continuous at $x = 0$?

$$\log(1 + 3x) / e^x, \text{ if } x > 0$$

28. If function f is differentiable at $x = a$, find

$$\lim_{x \rightarrow a} \frac{x^2 f(a) - a^2 f(x)}{x - a}$$

29. Let $f(x) = x + k$, if $x \leq 1$ show that f is continuous
 $kx^2 + 1$, if $x > 1$ at $x = 1$. Find k , so that f is differentiable at $x = 1$

Differentiate each of the following with respect to x in Exercises 30 to 49:

30. $\sin^{-1} (a + b \cos x / b + a \cos x)$
31. $\log (x + \sqrt{a^2 + x^2})$
32. $\sin (m \sin^{-1} x)$
33. $\log_e (\sin x)$
34. $\sqrt{a^2 + x^2} + \sqrt{a^2 - x^2} / \sqrt{a^2 + x^2} - \sqrt{a^2 - x^2}$
35. $\cos^{-1} (\sqrt{(1 + \cos 2x) / 2})$
36. $\tan^{-1} (a \cos x - b \sin x / b \cos x + a \sin x)$
37. $\cot^{-1} (\sqrt{1 + x^3 - x})$
38. $\sin^{-1} (\sqrt{x - 1} - \sqrt{1 - x^2})$
39. $\sin^{-1} (\sqrt{1 + x} + \sqrt{1 - x} / 2)$
40. $\tan^{-1} (2a / 1 - a^2)$, $a > 1$
41. $x^2 - 2x$
42. x^x
43. $\log(x^x + \operatorname{cosec} x)$
44. $x^{(\cos x)} + (\cos x)^x$
45. $\sin^{-1} (5x + 12 \sqrt{1 - x^2} / 13)$
46. $\tan^{-1} (x / \sqrt{1 - x^2} + \sqrt{1 + x^2} / 1 - x^2)$
47. $\log (\sqrt{x^2 + a^2} - x / \sqrt{x^2 + a^2} + x)$
48. $(x/y)^x$
49. $\sqrt{(x - 3)(x^2 + 4) / 3x^2 + 4x + 5}$
50. If $y = x^y + e^x$, prove that $dy/dx = \sqrt{y^2 - 4}$
51. If $y = \log (\sqrt{1 + x} - \sqrt{x - 1})$, show that $dy/dx = 1 / 2\sqrt{x^2 - 1}$
52. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$, show that
 $dy/dx = -(ax + hy + g) / (hx + by + f)$
53. Find dy/dx , if $\sin(xy) + x/y = x^2 - y$
54. If $x^2 + y^2 = r - 1$ and $x^4 + y^4 = r^2 + 1/r^2$, show that $x^2 dy/dx / y = 1$
55. If $y = x \sin y$, show that $dy/dx = y / x(1 - x \cos y)$
56. If $xy = (x + y)^n$, $x \neq m y$, show that $dy/dx = y / x$
57. Given that $\cos(x/2) \cos(x/4) \cos(x/8) = \sin x / \sin x$,
 prove that $1/2^2 + 1/2^2 * \sec^2 (x/4) + 1/2^4 * \sec^2 (x/8) + \dots =$
 $\operatorname{cosec} x - 1/x$
58. If $y = e^{(x+y)}$, show that $dy/dx = y / 1 - y$

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59. If $e^x = y^x$, show that $dy/dx = (\log y)^2 / \log y - 1$
60. If $e^x + e^{-x} = c$, show that $dy/dx = -e^x$
61. If $x = a \cos^3 \theta$ and $y = a \sin^3 \theta$, find dy/dx at $\theta = \pi/4$
62. Differentiate $\tan^{-1}((2x / 1 - x^2))$ with respect to $\sin^{-1}((2x / 1 + x^2))$
63. Differentiate $\tan^{-1}(\sqrt{(1 + x^2)} - \sqrt{(1 - x^2)} / \sqrt{(1 + x^2)} + \sqrt{(1 - x^2)})$ with respect to $\cos^{-1} x^2$.
64. Prove that the derivative of $\tan^{-1}(\sqrt{(1+x^2)}-1)/x$ with respect to $\tan^{-1}x$ is independent of x .
65. If $e^y(x+1) \sim 1$, show that $(d^2y/dx^2) = (dy/dx)^2$
66. If $\log y = \tan^{-1}x$, show that $(1 + x^2)y_2 + (2x - 1)y_1 = 0$.
67. If $x = a \sec \theta$ and $y = a \tan \theta$, find d^2y/dx^2 at $\theta = \pi/4$
68. If $y = x^x$, prove that $xyy_2 - xy_1^2 - y^2 = 0$.
69. If $x = a(\theta + \sin \theta)$ and $y = a(1 - \cos \theta)$, find d^2y/dx^2 at $\theta = \pi/2$
70. If $y = x \log (x/(a+bx))$, prove that $d^2y/dx^2 = 1/x (a/(a+bx))^2$
71. If $f(x) = ((3+x)/(1+x))^{(2+3x)}$, find $f'(0)$.
72. If $y = \tan^{-1} (5ax/(a^2-6x^2))$.
Prove that $dy/dx = 3a/(a^2 + 9x^2) + 2a/(a^2 + 4x^2)$
73. If $y\sqrt{(1 + x^2)} = \log[\sqrt{(1+x^2)} - x]$.
Show that $(x^2 + 1)dy/dx + xy + 1 = 0$.
74. Verify Rolle's Theorem for the function
 $f(x) = \log(x^2 + 2) - \log 3$ on $[-1, 1]$.

State which of the following is continuous as well as Long Answer I / Long Answer II Type

1. differentiable for $x \in \mathbb{R}$

- (a) $|x|$ (b) $[x]$
(c) polynomial function (d) $\text{sgn}(x)$

2. Derivative of with respect to x , is

3. Find the relationship between a and b so that the function f defined by

$$f(x) = \begin{cases} ax + 1, & \text{if } x \leq 3 \\ bx + 3, & \text{if } x > 3 \end{cases}$$

is continuous at $x = 3$.

[NCERT: AI 2011]

- (a) 2 (b) $1/(x-1)^2$
(c) $(2x-1) / (x-1)^2$ (d) $-1/(x-1)^2$

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4. For what value of λ is the function defined by

$$\lambda(x^2 - 2x), \text{ if } x \leq 0$$

$$f(x) = 4x + 1, \text{ if } x > 0 \quad \text{continuous at } x = 0?$$

[NCERT: Foreign 2011]

5. Derivative of $x/x-1$ with respect to x , is

(a) 2

(b) $1/(x-1)^2$

(c) $2x-1 / (x-1)^2$

(d) $-1/(x-1)^2$

6. Derivative of $\sin x$ with respect to $\log x$, is

(a) $x / \cos x$

(b) $\cos x / x$

(c) $x \cos x$

(d) $x^2 \cos x$

7. Differentiation for $x \in \mathbb{R}$

(a) $|x|$

(b) $[x]$

(c) polynomial function

(d) $\text{sgn}[x]$

8. Examine the continuity of the function $f(x) = x + 3^x$ $x \in \mathbb{R}$.

9. State the points of discontinuity for the function

$$f(x) = [x], \text{ in } -3 < x < 3.$$

[HOTS]

10. Find the point of discontinuity if any for the function

$$f(x) = 1/x - 5$$

[NCERT]

11. Differentiate $y = e^x + e^{2x} + e^{3x} + e^{4x} + e^{5x}$ with respect to x .

12. If $y = 500e^{3x} + 600e^{-5x}$, show that $dy = 49y$.

[NCERT]

13. Verify the Rolle's Theorem for the function $f(x) = \sin x$ in $[0, \pi]$.

14. Verify the Rolle's Theorem for the function $f(x) = x$ in $[-1, 1]$.

15. Verify Mean Value Theorem for the function

$$f(x) = (x-1)^{2/3} \text{ in } [0, 2].$$

[HOTS]

16. Find the derivative of $f(\log x)$ with respect to x , where

$$f(x) = \log x.$$

17. Find the derivative of $\sin^{-1}x/1 + \sin^{-1}x$ with respect to $\sin^{-1}x$.

18. The derivative of a differentiable even function is odd function. State true or false.

19. It is known that for $x \neq 1$, $1 + x + x^2 + \dots + x^{n-1} = 1 - x^n / 1 - x$

$$\text{Hence find the sum of the series } 1 + 2x + 3x^2 + \dots + (n-1)x^{1-2}$$

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22. Show that the function $f(x) = 2x - |x|$ is continuous but not differentiable at $x = 0$.

[Foreign 2013]

23. Is the function $f(x) = 3x + 4 \tan x / x$ continuous $x=0$? If not how should we define the function to make it continuous?

24. If $f(x) = \begin{cases} x & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$, find whether $f(x)$ is continuous at $x = 0$.

[HOTS]

25. Is the function $f(x) = \begin{cases} x-1 & \text{if } x \neq 1 \\ k & \text{if } x = 1 \end{cases}$ continuous

$$F(x) = \begin{cases} \sin 5x / 3x & x \neq 0 \\ k & x = 0 \end{cases}$$

26. For what value of k is the following function continuous at $x=0$?

$$f(x) = \begin{cases} \sin 5x / x & x \neq 0 \\ k & x = 0 \end{cases}$$

27. Discuss the continuity of the function

$$\log(1+3x)$$

28. Show that the function defined by $f(x) = \cos x^2$ is a continuous function.

[NCERT]

29. Find the value of k such that the function

$$f(x) = \begin{cases} 2x^2 + 2 - 16 & \text{if } x \neq 2 \\ k & \text{if } x = 2 \end{cases}$$

$$f(x) = \begin{cases} 4 - 16 & \text{if } x \neq 2 \\ k & \text{if } x = 2 \end{cases} \text{ is continuous at } x = 2.$$

$$k, \text{ if } x = 2$$

[NCERT Exemplar]

30. For what value of k , is the following function continuous at $x = 0$?

$$f(x) = \begin{cases} 1 - \cos 4x / 8x^2 & \text{if } x \neq 0 \\ k & \text{if } x = 0 \end{cases}$$

[NCERT Exemplar]

Differentiate each of the following with respect to x
(Exercises 31 to 40):

31. $y = \sin^{-1} (5x + 12\sqrt{1-x^2}/13)$

32. $y = \sqrt{(\sec x - 1)/(\sec x + 1)}$

33. $y = \cos^{-1} ((3x + 4\sqrt{1-x^2})/5)$

34. $f(x) = \tan^{-1}((1-x)/(1+x)) - \tan^{-1}((x+2)/(1-2x))$

35. $y = \sin^{-1}(\cos x) + \cos^{-1}(\sin x)$.

[HOTS]

36. $y = \sin^{-1}(\sqrt{1+x} + \sqrt{1-x})/2$

37. $y = \sin^{-1} [2a\sqrt{1-a^2x^2}]$

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38. $y = \cot^{-1}((1+x)/(1-x))$
39. $y = \tan^{-1}(\sqrt{(1+a^2x^2 - 1)}/(ax))$ [HOTS]
40. $y = \tan^{-1}(\sqrt{(1+x^2)} - \sqrt{(1-x^2)}) / (\sqrt{(1+x^2)} + \sqrt{(1-x^2)}), x^2 \leq 1.$ [Delhi 2015]
41. Differentiate $\cot^{-1}(\sqrt{(1+\sin x)} + \sqrt{(1-\sin x)}) / (\sqrt{(1+\sin x)} - \sqrt{(1-\sin x)}),$
 $0 < x < \pi/2$ [NCERT]
42. Differentiate $\sec^{-1}(1/(4x^3 - 3x)), 0 < x < 1/\sqrt{2}$ w.r.t. x [NCERT Exemplar]
43. Prove that $d/dx [x/2\sqrt{(a^2 - x^2)} + a^2/2 \sin^{-1} x/a] = \sqrt{(a^2 - x^2)}$ [Foreign 2011]
44. Differentiate $\tan^{-1}(\sqrt{(1-x^2)}/x)$ with respect to $\cos^{-1}(2x\sqrt{(1-x^2)}),$
when $x \neq 0.$ [Delhi 2014]
45. Differentiate $\tan^{-1}(\sqrt{(1+x^2)} - 1)/x$ with respect to $\sin^{-1}((2x)/(1+x^2)),$
when $x \neq 0.$ [Delhi 2014]
46. Find $dy/dx,$ if $y = \tan^{-1}(x / (1 + \sqrt{(1-x^2)}))$
47. If $x = \cos t(3 - 2\cos^2 t)$ and $y = \sin t(3 - 2\sin^2 t),$ find the value of dy/dx
at $t = \pi/4.$ [AI 2014]
48. If $x = a \cos \theta + b \sin \theta$ and $y = a \sin \theta - b \cos \theta,$ show that $y^2 d^2y/dx^2 - x$
 $dy/dx + y = 0.$ [Delhi 2015, Foreign 2011]
49. If $e^z + e^y = e^x,$ prove that $dy/dx + e^z = 0.$ [Foreign 2014]
50. If $f(x) = \sqrt{(x^2 + 1)}; g(x) = (x+1)/(x^2 + 1)$ and $h(x) = 2x - 3,$ then find
 $f'\{h'[g(x)]\}.$ [Foreign 2015]
51. If $y = (x + \sqrt{(1+x^2)}),$ then show that
 $(1+x^2) * d^2y/dx^2 + x * dy/dx = n^2y.$ [Foreign 2010]
52. Find $dy/dx,$ if $y = \cos(\log x^2).$ [HOTS]
53. Find $dy/dx,$ if $y = \cos x + (\sin x)^1/x$
54. Find $dy/dx,$ if $y = x^2 - \cos x + x^2 - 1/x^2 + 1$
55. If $x = a(\cos t + \log \tan t/2), y = a(1 + \sin t),$ find d^2y/dx^2
56. If $x = a(\theta - \sin \theta), y = a(1 + \cos \theta),$ find $d^2y/dx^2.$ [Delhi 2011]
57. If $x = a(\cos t + t \sin t)$ and $y = a(\sin t - t \cos t),$
 $0 < t < \pi/2,$ find $d^2y/dx^2, dy/dx$ and $d^2y/dx^2.$ [Delhi 2017(C), AI 2012]
58. If $x = a \sin t$ and $y = a(\cos t + \log \tan t/2),$ find $d^2y/dx^2.$ [Delhi 2013]
59. If $x = a \cos^3 \theta$ and $y = a \sin^3 \theta,$ then find the value of d^2y/dx^2 at
 $\theta = \pi/6.$ [AI 2013]
60. If $x \log y + y \log x = 5,$ find $dy/dx.$

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61. If $\log(x^2 + y^2) = 2\tan^{-1}(y/x)$, then show that $dy/dx = x+y/x-y$ [Delhi 2019]
62. If $y = \log(x + \sqrt{x^2 + 1})$, then prove that $(x^2 + 1) * d^2y/dx^2 + x * dy/dx = 0$. [Delhi 2013; Foreign 2011]
63. If $y = \sin^{-1} x$, show that $(1 - x^2) * d^2y/dx^2 - x * dy/dx = 0$. [NCERT; Delhi 2012]
64. If $y = 3 \cos(\log x) + 4 \sin(\log x)$, show that $x^2 * d^2y/dx^2 + x * dy/dx + y = 0$ [NCERT; AI 2016; Delhi 2012]
65. If $y^x = e^{(y - x)}$, prove that $dy/dx = (1 + \log y)^2 / \log y$. [AI 2013]
66. If $x^y = e^{(x-y)}$, prove that $dy/dx = \log x / (1 + \log x)^2$. [NCERT Exemplar; AI 2013]
67. Differentiate, $\tan^{-1}(\sqrt{(1+x^2)}-1)/x$ with respect to $\tan^{-1} x$, when $x \neq 0$. [NCERT Exemplar; Foreign 2013]
68. If $y = \sin^{-1}(x^2\sqrt{(1-x^2)} + x\sqrt{(1-x^4)})$, then prove that $dy/dx = 2x/\sqrt{(1-x^4)} + 1/\sqrt{(1-x^2)}$
69. If $\sqrt{(1-x^8)} + \sqrt{(1-y^6)} = a^3(x^3 - y^3)$, prove that $dy/dx = x^2y^4/y^2x^6$
70. If $x^2 = e^{(e^{-y})}$, show that $dy/dx = 2 - \log x / (1 - \log x)^2$
71. If $\sin y = x \cos(a + y)$, show that $dy/dx = \cos^2(a + y) / \cos a$
Also, show that $dy/dx = \cos a$, when $x=0$. [Delhi 2018(C)]
72. If the derivative of $\tan^{-1}(a + bx)$ takes the value 1 at $x = 0$, prove that $b = 1 + a^2$.
73. If $y = e^{(e^{(e^{-x})})}$, prove that $dy/dx = y / (1 - y)$
74. Differentiate $\tan^{-1}(2x/1-x^2)$ with respect to $\sin^{-1}(2x/1+x^2)$
75. If $y = f((2x-1)/(x^2+1))$ and $f'(x) = \sin \lambda^2$, find dy/dx . [HOTS]
76. If $y = \sin(\pi \sin^{-1} x)$, prove that $(1-x^2)y_2 - xy_1 + \pi^2 y = 0$.
77. Differentiate $\tan^{-1}((3x-x^3)/(1-3x^2))$ w.r.t. $\tan^{-1}(x/\sqrt{(1-x^2)})$
78. If $y = \sqrt{(1 - \sin 2x)/(1 + \sin 2x)}$, show that $dy/dx + \sec^2(\pi/4 - x) = 0$.
79. If $x^2 + y^2 = 2$ (or a or b or a + b in place of 2), find dy/dx .
80. Find dy/dx , if $\tan(x + y) + \tan(x - y) = 1$. [HOTS]
81. If $x^2y = 1$, find dy/dx .
82. If $x \sin(a + y) + \sin a \cos(a + y) = 0$, prove that $dy/dx = \sin^2(a + y) / \sin a$ [NCERT Exemplar]

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83. If $x = e^{(x/y)}$, prove that $dy/dx = x - y/x \log x$ [NCERT]
84. If $\sqrt{(1-x^2)} + \sqrt{(1-y^2)} = a(x - y)$, prove that
 $dy/dx = \sqrt{(1 - y^2)}/\sqrt{(1 - x^2)}$ [NCERT Exemplar, HOTS]
85. If $\cos y = x \cos (a + y)$ with $\cos a \neq 1$, prove that
 $dy/dx = \cos^2(a + y)/\sin a$ [NCERT; Foreign 2014]
86. Verify the Rolle's Theorem for the function
 $f(x) = \sin^4 x + \cos^4 x$ in $[0, \pi/2]$
87. Verify the Rolle's Theorem for the function
 $f(x) = \sin 3x$ in $[0, \pi]$.
88. Verify the Rolle's Theorem for the function
 $f(x) = \sqrt{4 - x^2}$ in $[-2, 2]$. [NCERT Exemplar]
89. Verify Mean Value Theorem for the function
 $f(x) = \sqrt{25 - x^2}$ in $[-3, 4]$.
90. If $f(x)$ and $g(x)$ are functions derivable in $[a, b]$ such that $f(a) = 4, f(b) = 10, g(a) = 1, g(b) = 3$, show that for $a < c < b$, we have $f'(c) = 3g'(c)$. [HOTS]
91. Examine the following function $f(x)$ for continuity at $x = 1$ and differentiability at $x = 2$.
 $f(x) = \begin{cases} 5x-4, & 0 < x < 1 \\ 4x^2 - 3x, & 1 < x < 2 \\ 3x + 4, & x \geq 2 \end{cases}$ [Guwahati 2015]
92. If $y = x^3 \log(1/x)$, then prove that $x^2(d^2y/dx^2) - 2(dy/dx) + 3x^2 = 0$. [Guwahati 2015]
93. If $(x / x-y) = \log(a / x-y)$, then prove that $dy/dx = 2 - (x / y)$. [Guwahati 2015]
94. Let $f(x) = x - |x - x^2|, x \in [-1, 1]$. Find the point of discontinuity, (if any), of this function in $[-1, 1]$. [Bhubaneswar 2015]
95. If $y = \log((x / (a + bx))^{(1/2)})$, prove that $x^2(d^2y/dx^2) = ((dy/dx) - y)^2$. [Bhubaneswar 2015]
96. Find the derivative of $\sec^{-1}((1 / (2x^2 - 1)))$ w.r.t. $\sqrt{1 - x^2}$ at $x = 1/2$. [Bhubaneswar 2015]
97. If $x = \alpha \sin 2t (1 + \cos 2t)$ and $y = \beta \cos 2t (1 - \cos 2t)$, show that $dy/dx = (\beta / \alpha) \tan t$. [Patna 2015]

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(DAILY PRACTICE PAPER)

[CLASS XII]

98. Find $d/dx \cos^{-1}((x - x^{-1}) / (x + x^{-1}))$. [Patna 2015]
99. Find the derivative of the following function $f(x)$ w.r.t. x , at $x = 1$: $\cos^{-1}(\sin(\sqrt{(1 + x) / 2}) + x^2)$ [Patna 2015]
100. If function $f(x) = |x - 3| + |x - 4|$, then show that $f(x)$ is not differentiable at $x = 3$ and $x = 4$. [Chennai 2015]
101. If $y = x^2 / 2$, find dy/dx . [Chennai 2015]
102. If $y = \sqrt{x+1} - \sqrt{x-1}$, prove that $(x^2 - 1)(d^2y/dx^2) + x(dy/dx) - 1/4y = 0$ [Chennai 2015]



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