MATHS

BOOKS - NCERT MATHS (ENGLISH)

LIMITS AND DERIVATIVES

Short Answer Types Questions

1. Evaluate $\lim\limits_{x \to 3} \dfrac{(x^2 - 9)}{(x - 3)}$

A. 6

B. 3

C. 9

D. none of the above

Answer: A

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2. Evaluate $\lim_{x \to 1/2} \dfrac{\left(4x^2 - 1\right)}{(2x - 1)}$.

A. 2

B. 3

C. 0

D. 1

Answer: A

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3. Evaluate $\lim\limits_{h \to 0} \dfrac{\sqrt{x+h} - \sqrt{x}}{h}$

A. $\dfrac{1}{2\sqrt{x}}$

B. $\dfrac{1}{\sqrt{x}}$

C. $\dfrac{1}{2x}$

D. none of these

Answer: A

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4. Evaluate $\lim\limits_{x \to 0} \dfrac{(x+2)^{1/3} - 2^{1/3}}{x}$

A. $\dfrac{1}{3}(2)^{2/3}$

B. $\dfrac{1}{3. (2)^{2/3}}$

C. $\dfrac{1}{3}$

D. none of the above

Answer: B

5. Evaluate $\lim\limits_{x \to 0} \dfrac{(1+x)^6 - 1}{(1+x)^2 - 1}$.

A. 1

B. 2

C. 3

D. 4

Answer: C

6. Evaluate $\lim\limits_{x \to a} \dfrac{(2+x)^{5/2} - (a+2)^{5/2}}{x - a}$

7. Evaluate $\lim\limits_{x \to 1} \dfrac{x^4 - \sqrt{x}}{\sqrt{x} - 1}$.

8. Evaluate $\lim\limits_{x \to 2} \dfrac{x^2 - 4}{\left(\sqrt{3x - 2} - \left(\sqrt{x + 2}\right)\right)}$

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9. Evaluate, $\lim\limits_{x \to \sqrt{2}} \dfrac{x^4 - 4}{x^2 + 3\sqrt{2}x - 8}$.

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10. Evaluate $\lim\limits_{x \to 0} \left(\dfrac{\sqrt{1 + x^3} - \sqrt{1 - x^3}}{x^2} \right)$

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11. Evaluate $\displaystyle\lim_{x \to 0} \dfrac{\sqrt{1 + x^3} - \sqrt{1 - x^3}}{x^2}$

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12. Evaluate $\displaystyle\lim_{x \to -3} \dfrac{x^3 + 27}{x^5 + 243}$

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13. Evaluate the following limits :

$\displaystyle\operatorname*{Lim}_{x \to \frac{1}{2}} \left(\dfrac{8x - 3}{2x - 1} - \dfrac{4x^2 + 1}{4x^2 - 1} \right)$

14. Find the value of n, if $\lim\limits_{x \to 2} \dfrac{x^n - 2^n}{x - 2} = 80,$ $n \in N.$

A. 3

B. 5

C. 4

D. 6

Answer: B

15. Given, $\lim\limits_{x \to 0} \dfrac{\sin 3x}{\sin 7x}$.

A. $\dfrac{3}{5}$

B. $\dfrac{3}{7}$

C. $\dfrac{1}{5}$

D. $\dfrac{7}{3}$

Answer: B

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16. Eavaluate $\displaystyle\lim_{x \to 0} \frac{\sin^2 2x}{\sin^2 4x}$

17. Evaluate $\displaystyle\lim_{x \to 0} \frac{1 - \cos 2x}{x^2}$

A. 2

B. 1

C. 4

D. 3

Answer: A

18. Evaluate $\displaystyle \lim_{x \to 0} \frac{2\sin x - \sin 2x}{x^3}$

19. Evaluate $\displaystyle \lim_{x \to 0} \frac{1 - \cos mx}{1 - \cos nx}$.

20. Evaluate $\displaystyle\lim_{x \to \left(\frac{\pi}{3}\right)} \frac{\sqrt{1 - \cos 6x}}{\sqrt{2}\left(\frac{\pi}{3} - x\right)}$

21. Evaluate, $\displaystyle\lim_{x \to (\pi/4)} \frac{\sin x - \cos x}{x - \frac{\pi}{4}}$

A. $\sqrt{2}$

B. 2

C. 0

D. 1

Answer: A

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22. Evaluate, $\lim\limits_{x \to (\pi/6)} \dfrac{\sqrt{3}\sin x - \cos x}{x - \frac{\pi}{6}}$

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23. Evaluate, $\lim\limits_{x \to 0} \dfrac{\sin 2x + 3x}{2x + \tan 3x}$.

24. Evaluate $\lim\limits_{x \to 0} \dfrac{\sin x - \sin a}{\sqrt{x} - \sqrt{a}}$

25. Evaluate, $\lim\limits_{x \to (\pi/6)} \dfrac{\cot^2 x - 3}{\operatorname{cosec} x - 2}$

A. 2

B. 3

C. 4

D. 5

Answer: C

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26. Evaluate $\lim\limits_{x \to 0} \dfrac{\sqrt{2} - \sqrt{1 + \cos x}}{\sin^2 x}$.

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27. Evaluate, $\lim\limits_{x \to 0} \dfrac{\sin x - 2\sin 3x + \sin 5x}{x}$

28. Evaluate, $\lim\limits_{x \to 1} \dfrac{x^4 - 1}{x - 1} = \lim\limits_{x \to k} \dfrac{x^3 - k^3}{x^2 - k^2}$, then find the value of k.

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29. Differentiate function with respect to x,$f(x)=\dfrac{x^4 + x^3 + x^2 + 1}{x}$

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30. Differentiate with respect to x, $\left(x + \dfrac{1}{x} \right)^3$

31. Differentiate with respect to x:

$$(3x + 5)(1 + \tan x)$$

32. Differentiate with respect to x:

$$(\sec x - 1)(\sec x + 1)$$

33. Differentiate with respect to x to the given

function $\dfrac{3x + 4}{5x^2 - 7x + 9}$

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34. Differentiate with respect to x, $\dfrac{x^5 - \cos x}{\sin x}$

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35. differentiate with respect to x to the given

function $\dfrac{x^2 \cos\left(\frac{\pi}{4}\right)}{\sin x}$

36. Differentiate w.r.t to x ,

$$\left(ax^2 + \cot x\right)\left(p + q\cos x\right)$$

37. Find derivative of the following functions (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers): $\dfrac{a + b\sin x}{c + d\cos x}$

38. Differentiate w.r.t to 'x', $(\sin x + \cos x)^2$

39. Differentiation of $(2x - 7)^2(3x + 5)^3$

40. Differentiate w.r.t to' x 'to the following function. $x^2 \sin x + \cos 2x$

41. Differentiate with respect to x: $\sin^3 x \cos^3 x$

42. Differentiate the following function with respect of x : $\dfrac{1}{ax^2 + bx + c}$

Long Answer Type Questions

1. Differentiate w.r.t to' x 'using first principal,

$$\cos\left(x^2 + 1\right)$$

2. Differentiate the following function with respect of $x : (ax + b)/(cx + d)$

3. Using First principal differentiate w.r.t 'x':

$x^{2/3}$

4. Differentiate function w.r.t 'x',using first principal $x \cos x$

5. $\lim\limits_{y \to 0} \dfrac{(x + y)\sec(x + y) - x\sec x}{y}$

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6.

$\lim\limits_{x \to 0} \dfrac{\sin(\alpha + \beta)x + \sin(\alpha - \beta)x + \sin 2\alpha x}{\cos 2\beta x - \cos 2\alpha x} \cdot x$

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7. The value of $\lim\limits_{x \to \pi/4} \dfrac{\tan^3 x - \tan x}{\cos\left(x + \dfrac{\pi}{4}\right)}$ is

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8. $\displaystyle\lim_{x \to (\pi)} \dfrac{1 - \sin\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right)\left(\cos\left(\frac{x}{4}\right) - \sin\left(\frac{x}{4}\right)\right)}$

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9. Show that, $\displaystyle\lim_{x \to 4} \dfrac{|x - 4|}{x - 4}$, does not exist

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10. Let $f(x) = \dfrac{k \cos x}{\pi - 2x}$ if $x \neq \dfrac{\pi}{2}$ and $f(x) = 3$ if $x = \dfrac{\pi}{2}$ then find the value of k if

$$\lim_{x \to \frac{\pi}{2}} f(x) = f\left(\dfrac{\pi}{2}\right)$$

11. if $f(x) = \begin{cases} x + 2, & x \leq -1 \\ cx^2, & x > -1 \end{cases}$, then find c

when $\lim (x \to -1) f(x)$ exists.

1. $\lim\limits_{x \to (\pi)} \dfrac{\sin x}{x - \pi}$ is equal to

A. 1

B. 2

C. -1

D. -2

Answer: C

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

A. 2

B. $\dfrac{3}{2}$

C. $-\dfrac{3}{2}$

D. 1

Answer: A

3. $\lim\limits_{x \to 0} \dfrac{(1+x)^n - 1}{x}$ is equal to

A. n

B. 1

C. $-n$

D. 0

Answer: A

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4. $\lim\limits_{x \to 1} \dfrac{x^m - 1}{x^n - 1}$ is equal to

A. 1

B. $\dfrac{m}{n}$

C. $-\dfrac{m}{n}$

D. $\dfrac{m^2}{n^2}$

Answer: B

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5. $\lim\limits_{\theta \to 0} \dfrac{1 - \cos 4\theta}{1 - \cos 6\theta}$ is equal to

A. $\dfrac{4}{9}$

B. $\dfrac{1}{2}$

C. $-\dfrac{1}{2}$

D. -1

Answer: a

6. $\lim\limits_{x \to 0} \dfrac{\cosec x - \cot x}{x}$ is equal to

A. $\dfrac{1}{2}$

B. -1

C. $-\dfrac{1}{2}$

D. 1

Answer: a

7. $\displaystyle\lim_{x \to 0} \frac{\sin x}{\sqrt{x+1} - \sqrt{1-x}}$ is equal to

A. 2

B. 0

C. 1

D. -1

Answer: C

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8. $\displaystyle\lim_{x \to (\pi/4)} \frac{\sec^2 x - 2}{\tan x - 1}$ is

A. 3

B. 1

C. 0

D. 2

Answer: D

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9. $\displaystyle\lim_{x \to 1} \frac{(2x - 3)\left(\sqrt{x} - 1\right)}{2x^2 + x - 3}$

A. $\dfrac{1}{10}$

B. $-\dfrac{1}{10}$

C. 1

D. None of these

Answer: B

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10. If $f(x) = \left\{ \dfrac{\sin[x]}{[x]}, [x] \neq 0; 0, [x] = 0 \right\}$,

Where [.] denotes the greatest integer

function, then $\lim\limits_{x \to 0} f(x)$ is equal to

A. 1

B. 0

C. -1

D. Does not exist

Answer: d

11. $\lim\limits_{x \to 0} \dfrac{|\sin x|}{x}$ is equal to

A. 1

B. -1

C. Does not exist

D. None of these

Answer: C

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12. If f(x) $=\{x^2 - 1, 0 < x < 2$, $2x + 3, 2 \leq x < 3$ then 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. $x^2 - 10x + 21 = 0$

Answer: d

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13. $\lim\limits_{x \to 0} \dfrac{\tan 2x - x}{3x - \sin x}$ is equal to

A. 2

B. $\dfrac{1}{2}$

C. $-\dfrac{1}{2}$

D. $\dfrac{1}{4}$

Answer: B

14. if $f(x) = x - [x], \in R$, then $f'\left(\dfrac{1}{2}\right)$ is equal to

A. $\dfrac{3}{2}$

B. 1

C. 0

D. -1

Answer: b

15. if $y = \sqrt{x} + \dfrac{1}{\sqrt{x}}$, then $\dfrac{dy}{dx}$ at x=1 is equal to

A. 1

B. $\dfrac{1}{2}$

C. $\dfrac{1}{\sqrt{2}}$

D. 0

Answer: D

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16. If f(x) $= \dfrac{x-4}{2\sqrt{x}}$, then $f'(1)$ is equal to

A. $\dfrac{5}{4}$

B. $\dfrac{4}{5}$

C. 1

D. 0

Answer: a

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17. if $y = \dfrac{1 + \frac{1}{x^2}}{1 - \frac{1}{(x)^2}}$,then $\dfrac{dy}{dx}$ is equal to

A. $\dfrac{-4x}{(x^2 - 1)^2}$

B. $\dfrac{-4x}{x^2 - 1}$

C. $\dfrac{1 - x^2}{4x}$

D. $\dfrac{4x}{x^2 - 1}$

Answer: A

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18. if $y = \dfrac{\sin x + \cos x}{\sin x - \cos x}$, then $\dfrac{dy}{dx}$ at x=0 is equal to

A. -2

B. 0

C. $\dfrac{1}{2}$

D. Does not exist

Answer: a

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19. if $y = \dfrac{\sin(x + 9)}{\cos x}$, then $\dfrac{dy}{dx}$ at x=0 is equal to

A. cos9

B. sin9

C. 0

D. 1

Answer: a

20. If $f(x) = 1 + x + \dfrac{x^2}{2} + \; + \dfrac{x^{100}}{100}$, then

$f'(1)$ is equal to

A. $\dfrac{1}{100}$

B. 100

C. 0

D. Does not exist

Answer: B

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21. Find the derivative of $\dfrac{x^n - a^n}{x - a}$ at x=a for some constant a.

A. 1

B. 0

C. $\dfrac{1}{2}$

D. Does not exist

Answer: d

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22. If $f(x) = x^{100} + x^{99} + + x + 1$, then $f'(1)$ is equal to

A. 5050

B. 5049

C. 5051

D. 50051

Answer: A

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23. If

$$f(x) = 1 - x + x^2 - x^3 + \ldots - x^{99} + x^{100}$$

then $f'(1)$ equals

A. 150

B. -50

C. -150

D. 50

Answer: D

1. If $f(x) = \dfrac{\tan x}{x - \pi}$, then $\displaystyle \lim_{x \to (\pi)} f(x) =$

....

A. 1

B. 0

C. -1

D. none of the above

Answer: A

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2. $\lim\limits_{x \to 0} \left(\sin mx \cot\left(\dfrac{x}{\sqrt{3}} \right) \right) = 2,$ then

m=................

3. If $y = 1 + \dfrac{x}{1!} + \dfrac{x^2}{2!} + \dfrac{x^3}{3!} + \ldots\ldots,$ then $\dfrac{dy}{dx}$

4. Prove that $\displaystyle\lim_{x \to 3^+} \frac{x}{[x]} \neq \lim_{x \to 3^-} \frac{x}{[x]}$