



# MATHS

## BOOKS - S CHAND MATHS (ENGLISH)

### LIMITS AND DERIVATIVES

#### Examples

1. If  $G(x) = -\sqrt{25 - x^2}$ , then

$$\lim_{x \rightarrow 1} \frac{G(x) - G(1)}{x - 1} \text{ is}$$

(a)  $\frac{1}{24}$

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

(c)  $-\sqrt{24}$

(d) none of these

A.  $\frac{1}{4\sqrt{6}}$

B.  $\frac{1}{2\sqrt{6}}$

C.  $\frac{1}{\sqrt{6}}$

D.  $-\frac{1}{2\sqrt{6}}$

**Answer: B**



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

A. 0

B. -1

C. 1

D.  $\frac{1}{2}$

**Answer: A**



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3.  $\lim_{x \rightarrow 2} [x]$  where  $[\cdot]$  denotes the greatest integer function is equal to

A. A. 2

B. B. 1

C. C. 0

D. D. does not exist

**Answer: D**



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4.  $\lim_{x \rightarrow 0} \frac{a^x - 1}{\sqrt{1+x} - 1}$  is equal to

A.  $\log_e a$

B.  $2 \log_e a$

C.  $-2 \log_e a$

D.  $\frac{1}{2} \log_e a$

**Answer: B**



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5.  $\lim_{x \rightarrow 0} \frac{\log(1 + 3x)}{\sin 4x}$  is equal to

A.  $\frac{4}{3}$

B.  $-\frac{4}{3}$

C.  $\frac{3}{4}$

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

**Answer: C**



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6. If  $y = \frac{\sin x + \cos x}{\sin x - \cos x}$ , then  $\frac{dy}{dx}$  at  $x = 0$  is

A.  $-2$

B. 0

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

D.  $\frac{2}{3}$

**Answer: A**



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7. If  $f(9) = 9$  and  $f'(9) = 4$  then

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

A. 2

B. 3

C. 4

D.  $-4$

**Answer: C**



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## Multiple Choice Questions

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

(i) 0



(ii) 1

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

(iv) 2

A. 0

B. 1

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

D. 2

**Answer: C**



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2.  $\lim_{x \rightarrow 0} \frac{x}{\sin 3x}$  is equal to

(i) 3

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

(iii) 0

(iv) 1

A. 3

B.  $\frac{1}{3}$

C. 0

D. 1

**Answer: B**



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3.  $\lim_{x \rightarrow 0} \frac{\sqrt{4+x} - 2}{\sin x}$  is equal to

(i) 4

(ii) 1

(iii)  $\frac{1}{4}$

(iv) 0

A. 4

B. 1

C.  $\frac{1}{4}$

D. 0

**Answer: C**



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4. If  $\lim_{x \rightarrow a} \frac{x^9 - a^9}{x - a} = \lim_{x \rightarrow 5} (x + 4)$  then all

possible values of  $a$  are

(i) 2, 3

(ii) -2, 2

(iii) -1, 1

(iv) -3, 3

A. 2,3

B.  $-2, 2$

C.  $-1, 1$

D.  $-3, 3$

**Answer: C**



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5. Let  $f(x) = \begin{cases} x + 2, & x \leq -1 \\ cx^2, & x > -1 \end{cases}$  If  $\lim_{x \rightarrow -1} f(x)$  exists, then  $c$  is

(i)  $-1$

(ii)  $1$

(iii) 2

(iv) -2

A. - 1

B. 1

C. 2

D. - 2

**Answer: B**



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

A. (a) 2

B. (b) -2

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

D. (d)  $-\frac{1}{2}$

**Answer: C**



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7.  $\lim_{x \rightarrow 0} \frac{\tan 3x - 2x}{3x - \sin^2 x}$  is equal to

A.  $\frac{1}{3}$

B.  $-\frac{1}{3}$

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

D.  $-\frac{1}{2}$

**Answer: A**



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8.  $\lim_{x \rightarrow 0} \frac{1 - \cos mx}{1 - \cos nx}$  is equal to

A. (a)  $\frac{n^2}{m^2}$

B. (b)  $\frac{m^2}{n^2}$

C. (c)  $\frac{m}{n}$

D. (d)  $\frac{n}{m}$

**Answer: B**



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9.  $\lim_{x \rightarrow 0} \frac{\cos x - \cos 3x}{x(\sin 3x - \sin x)}$  is equal to

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

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

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

D. (d) 2

**Answer: D**



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10.  $\lim_{x \rightarrow 0} \frac{(1 - \cos 2x) \sin 5x}{x^2 \sin 3x}$  is equal to

(i)  $\frac{6}{5}$

(ii)  $\frac{5}{6}$

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

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

A.  $\frac{6}{5}$

B.  $\frac{5}{6}$

C.  $\frac{10}{3}$

D.  $\frac{3}{10}$

**Answer: C**



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11. If  $\lim_{x \rightarrow 0} k \cdot \cos ecx = \lim_{x \rightarrow 0} x \cos eckx,$

then k is

(i)  $-1, 1$

(ii)  $-2, 2$

(iii)  $-\frac{1}{2}, \frac{1}{2}$

(iv) none of these

A.  $-1, 1$

B.  $-2, 2$

C.  $-\frac{1}{2}, \frac{1}{2}$

D. none of these

**Answer: A**



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12.  $\lim_{x \rightarrow \pi} \frac{\sin x}{x - \pi}$  is equal to

A. A. 0

B. B. 1

C. C. -1

D. D. none of these

**Answer: C**



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13.  $\lim_{x \rightarrow 1} \frac{\sin \pi x}{x - 1}$  is equal to

A.  $\pi$

B.  $-\pi$

C.  $\frac{1}{\pi}$

D.  $-\frac{1}{\pi}$

**Answer: B**



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14.  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{2x - \pi}{\cos x}$  is equal to

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

B.  $-\frac{1}{2}$

C. 2

D. -2

**Answer: D**



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15.  $\lim_{x \rightarrow \frac{\pi}{2}} \left( \frac{\pi}{2} - x \right) \tan x$  is equal to (i) 1 (ii)  $-1$  (iii)  $\frac{\pi}{2}$  (iv)  $\frac{2}{\pi}$

A. 1

B.  $-1$

C.  $\frac{\pi}{2}$

D.  $\frac{2}{\pi}$

**Answer: A**



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16.  $\left( \lim \right)_{x \rightarrow \frac{\pi}{2}} \frac{\tan 2x}{x - \frac{\pi}{2}}$

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

B. B. 2

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

D. D. 3

**Answer: B**



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17.  $\lim_{x \rightarrow 0} \frac{e^x + \sin x - 1}{3x}$  is equal to (i)  $\frac{1}{3}$  (ii)  $-\frac{1}{3}$  (iii)  $\frac{2}{3}$  (iv)  $-\frac{2}{3}$

A.  $\frac{1}{3}$

B.  $-\frac{1}{3}$

C.  $\frac{2}{3}$

D.  $-\frac{2}{3}$

**Answer: C**



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18.  $\lim_{x \rightarrow 2} \frac{\log(x - 1)}{x - 2}$  is equal to

A. A. 0

B. B.  $-1$

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

D. D. 1

**Answer: D**



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19.  $\lim_{x \rightarrow 0} \frac{3^{2x} - 2^{3x}}{x}$  is equal to

A. A.  $2 \log \frac{3}{2}$

B. B.  $3 \log \frac{2}{3}$

C. C.  $\log \frac{9}{8}$

D. D.  $\log \frac{8}{9}$

**Answer: C**



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20.  $\lim_{x \rightarrow 0} \frac{|x|}{x}$  is equal to (i) 1 (ii)  $-1$  (iii) 0 (iv)

does not exist

A. 1

B.  $-1$

C. 0

D. does not exist

**Answer: D**



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**21.**  $\lim_{x \rightarrow \frac{3}{2}} [x]$  is equal to (i) 1 (ii)  $-1$  (iii) 2 (iv)

does not exist

A. 1

B.  $-1$

C. 2

D. does not exist

**Answer: A**



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22.  $\lim_{x \rightarrow 0} \frac{\cos^2 x - \sin^2 x - 1}{\sqrt{x^2 + 4} - 2}$  is equal to

(i) 4

(ii)  $-4$

(iii)  $8$

(iv)  $-8$

A.  $4$

B.  $-4$

C.  $8$

D.  $-8$

**Answer: D**



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

A. 2

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

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

D. 1

**Answer: A**



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



A. 2

B. 0

C. 1

D.  $-1$

**Answer: C**



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25.  $\lim_{x \rightarrow 0} \frac{|\sin x|}{x}$  is equal to (i) 1 (ii)  $-1$  (iii)

does not exist (iv) none of these

A. 1

B.  $-1$

C. does not exist

D. none of these

**Answer: C**



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**26.** The derivative of  $2x^3 - 3x^2 - 5x + 6$  at  $x = 1$  is

A. A. 0

B. B.  $-6$

C. C.  $-5$

D. D. 5

**Answer: C**



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**27.**

**if**

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

then  $f'(1)$  is equal to

A. A. 100

B. B. 50

C. C. 49

D. D. 51

**Answer: B**



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28. If  $f(x) = \frac{(3x + 1)(2\sqrt{x} - 1)}{\sqrt{x}}$ , then  $f'(1)$

is equal to

A. 5

B.  $-5$

C. 6

D.  $\frac{11}{2}$

**Answer: A**



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**29.** If  $f(x) = \frac{2 - 3 \cos x}{\sin x}$ , then  $f' \left( \frac{\pi}{4} \right)$  is equal to

A.  $2\sqrt{2} - 6$

B.  $6 - 2\sqrt{2}$

C.  $3 - \sqrt{2}$

D.  $\sqrt{2} - 3$

**Answer: B**



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30. If  $y = \sqrt{x} + \frac{1}{\sqrt{x}}$ , then  $\frac{dy}{dx}$  at  $x = 1$  is

A. 1

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

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

D. 0

**Answer: D**



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31. If  $y = \frac{1 + \frac{1}{x^2}}{1 - \frac{1}{x^2}}$ , then  $\frac{dy}{dx}$  is

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

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

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

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

**Answer: A**



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