



MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

DIFFERENTIAL CALCULUS - LIMITS AND CONTINUITY

Examples

1. Calculate $\lim_{x \rightarrow 0} |X|$.



Watch Video Solution

2. Consider the function $f(x) = \sqrt{x}, x \geq 0$



Watch Video Solution

3. Evaluate $\lim_{x \rightarrow 2^-} \lfloor x \rfloor$ and $\lim_{x \rightarrow 2^+} \lfloor x \rfloor$



Watch Video Solution

4. Let $f(x) = \begin{cases} x + 1 & x > 0 \\ x - 1 & x < 0 \end{cases}$



Watch Video Solution

5. Check if $\lim_{x \rightarrow 5} f(x)$ exists or not, where

$$f(x) = \begin{cases} \frac{|x+5|}{x+5} & \text{for } x \neq -5 \\ 0. & \text{for } x = -5 \end{cases}$$



[Watch Video Solution](#)

6. Calculate $\lim_{x \rightarrow 3} (x^3 - 2x + 6)$.



[Watch Video Solution](#)

7. Calculate $\lim_{x \rightarrow x_0} (5)$ for any real number x_0 .



[Watch Video Solution](#)

8. Compute $\lim_{x \rightarrow 8} (5x)$



Watch Video Solution

9. Compute $\lim_{x \rightarrow -2} \left(-\frac{3}{2}x \right)$



Watch Video Solution

10. Compute $\lim_{x \rightarrow 0} \left[\frac{x^2 + x}{x} + 4x^3 + 3 \right]$



Watch Video Solution

11. Calculate $\lim_{x \rightarrow -1} (x^2 - 3)^{10}$



Watch Video Solution

12. Calculate $\lim_{x \rightarrow -2} (x^3 - 3x + 6)(-x^2 + 15)$.



Watch Video Solution

13. Calculate $\lim_{x \rightarrow 3} \frac{(x^2 - 6x + 5)}{x^3 - 8x + 7}$



Watch Video Solution

14. Calculate $\lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x - 1}$.



Watch Video Solution

15. Find $\lim_{t \rightarrow 0} \frac{\sqrt{t^2 + 9} - 3}{t^2}$



Watch Video Solution

16. Compute $\lim_{x \rightarrow 1} \frac{x^3 - 1}{x - 1}$.



Watch Video Solution

17. Compute $\lim_{t \rightarrow 1} \frac{\sqrt{t} - 1}{t - 1}$



Watch Video Solution

18. Find $\lim_{x \rightarrow 0} \frac{(2 + x)^5 - 2^5}{x}$



Watch Video Solution

19. Find the positive integer n so that

$$\lim_{x \rightarrow 3} \frac{x^n - 3^n}{x - 3} = 27$$



Watch Video Solution

20. Find the relation between a and b if

$$\lim_{x \rightarrow 3} f(x) \quad \text{exists} \quad \text{where}$$
$$f(x) = \begin{cases} ax + b & \text{if } x > 3 \\ 3ax - 4b + 1 & \text{if } x < 3 \end{cases}$$

 [Watch Video Solution](#)

21. Calculate $\lim_{x \rightarrow 0} \frac{1}{(x^2 + x^3)}$

 [Watch Video Solution](#)

22. Evaluate $\lim_{x \rightarrow 2} \frac{1}{(x - 2)^3}$

 [Watch Video Solution](#)

23. Calculate $\lim_{x \rightarrow \infty} \frac{x^3 + 2x + 3}{(5x^2 + 1)}$



Watch Video Solution

24. Calculate $\lim_{x \rightarrow \infty} \frac{1 - x^2}{(3x + 2)}$



Watch Video Solution

25. Alcohol is removed from the body by the lungs, the kidneys, and by chemical processes in liver, At moderate concentration levels, the majority work

of removing the alcohol is done by the liver, less than 5% of the alcohol is eliminated by the lungs and kidneys. The rate r at which the liver process alcohol from the bloodstream is related to the blood alcohol concentration x by a rational function of the form $r(x) = \frac{ax}{x + \beta}$ for some positive constants a and β . Find the maximum possible rate of removal.



[Watch Video Solution](#)

26. The velocity in ft/sec of a falling object is

modeled by $r(t) = -\sqrt{\frac{32}{k}} \frac{1 - e^{-2t\sqrt{32k}}}{1 + e^{-2t\sqrt{23k}}}$ where

k is a constant that depends upon the size and shape of the object and the density of the air. Find the limiting velocity of the object, that is find

$$\lim_{t \rightarrow \infty} r(t).$$

 [Watch Video Solution](#)

27. Suppose that the diameter of an animal's pupil is given by $f(x) = \frac{160x^{-0.4} + 90}{4x^{-0.4} + 15}$ where x is the intensity of light and $f(x)$ is in mm. Find the diameter of the pupils with minimum light

 [Watch Video Solution](#)

28. Suppose that the diameter of an animal's pupil is given by $f(x) = \frac{160x^{-0.4} + 90}{4x^{-0.4} + 15}$ where x is the intensity of light and $f(x)$ is in mm. Find the diameter of the pupils with maximum light



[Watch Video Solution](#)

29. Evaluate $\lim_{x \rightarrow 0} x^2 \sin\left(\frac{1}{x}\right)$.



[Watch Video Solution](#)

30. Prove that $\lim_{x \rightarrow 0} \frac{x \sin x}{1 - \cos x} = 2$



Watch Video Solution

31. Show that

$$\lim_{x \rightarrow 0} x \left(\left[\frac{1}{x} \right] + \left[\frac{2}{x} \right] + \dots + \left[\frac{15}{x} \right] \right) = 120$$



Watch Video Solution

32. Evaluate : $\lim_{x \rightarrow 0} (1 + \sin x)^{2 \cos e x}$



Watch Video Solution

33. Evaluate : $\lim_{x \rightarrow \infty} \left(\frac{x+2}{x-2} \right)^x$



Watch Video Solution

34. Evaluate : $\lim_{x \rightarrow \frac{\pi}{4}} \frac{4\sqrt{2} - (\cos x + \sin x)^5}{1 - \sin 2x}$



Watch Video Solution

35. Do the limits of following functions exists as $x \rightarrow 0$? State reason for your answer.

$$\frac{\sin|x|}{x}$$



Watch Video Solution

36. Do the limits of following functions exists as $x \rightarrow 0$? State reason for your answer.

$$\frac{\sin x}{|x|}$$



Watch Video Solution

37. Do the limits of following functions exists as $x \rightarrow 0$? State reason for your answer.

$$\frac{x \lfloor x \rfloor}{\sin|x|}$$



Watch Video Solution

38. Do the limits of following functions exists as $x \rightarrow 0$? State reason for your answer.

$$\frac{\sin(x - \lfloor x \rfloor)}{x - \lfloor x \rfloor}$$



Watch Video Solution

39. Describe the interval (s) on which each function is continuous.

$$f(x) = \tan x$$



Watch Video Solution

40. Describe the interval (s) on which each function is continuous.

$$g(x) = \begin{cases} \sin\left(\frac{1}{x}\right) & x \neq 0 \\ 0 & x = 0 \end{cases}$$



Watch Video Solution

41. Describe the interval (s) on which each function is continuous.

$$h(x) = \begin{cases} x \sin\left(\frac{1}{x}\right) & x \neq 0 \\ 0 & x = 0 \end{cases}$$



Watch Video Solution

Additional Problems

1. Suppose $f(x) = \begin{cases} a + bx & x < 1 \\ 4 & x = 1 \\ b - ax & x > 1 \end{cases}$ and if

$\lim_{x \rightarrow 1} f(x) = f(1)$. What are possible values of a and b ?



[Watch Video Solution](#)

2. If $f(x) = \begin{cases} 2x + 1 & x \leq 0 \\ 3(x + 1) & x > 0 \end{cases}$. Find

$\lim_{x \rightarrow 0} f(x)$ and $\lim_{x \rightarrow 1} f(x)$.



[Watch Video Solution](#)

3. Find $\lim_{x \rightarrow 1} f(x)$ if $f(x) = \begin{cases} x^2 - 1 & x \leq 1 \\ x^2 + 1 & x > 1 \end{cases}$



Watch Video Solution

4. Evaluate $\lim_{x \rightarrow 0}$ where $f(x) = \begin{cases} \frac{|x|}{x} & x \neq 0 \\ 0 & x = 0 \end{cases}$



Watch Video Solution

5. Let a_1, a_2, \dots, a_n be fixed real number such that $f(x) = (x - a_1)(x - a_2) \dots (x - a_n)$

what $\lim_{x \rightarrow a} f(x)$ For $a \neq a_1, a_2, \dots, a_n$ compute

$$\lim_{x \rightarrow 0} f(x)$$



Watch Video Solution

6. Evaluate $\lim_{x \rightarrow \infty} \sqrt{x} (\sqrt{x+c} - \sqrt{x})$



Watch Video Solution

7. Evaluate: $\lim_{x \rightarrow \infty} \left(\sqrt{x^2 + x + 1} - \sqrt{x^2 + 1} \right)$



Watch Video Solution

8. Evaluate: $\lim_{n \rightarrow \infty} \frac{1 + 2 + 3 + \dots + n}{n^2}$



Watch Video Solution

9. Evaluate: $\lim_{n \rightarrow \infty} \frac{n!}{(n+1)! - n!}$



Watch Video Solution

10. Evaluate: $\lim_{x \rightarrow \infty} \left(\sqrt{x^2 + x + 1} - x \right)$



Watch Video Solution

11. Evaluate :

$$\lim_{x \rightarrow \infty} \frac{(x+1)^{10} + (x+2)^{10} + \dots + (x+100)^{10}}{x^{10} + 10^{10}}$$



Watch Video Solution

 Watch Video Solution

Exercise 9 1

1. Complete the table use the result the estimate the limits

$$\lim_{x \rightarrow 2} \frac{x - 2}{x^2 - x - 2}$$



Watch Video Solution

2. Evaluate the limits

$$\lim_{x \rightarrow 2} \frac{x - 2}{x^2 - 4}$$



Watch Video Solution

3. Evaluate the limit

$$\lim_{x \rightarrow 0} \frac{\sqrt{x+3} - \sqrt{3}}{x}$$



Watch Video Solution

4. Complete the table use the result the estimate
the limits

$$\lim_{x \rightarrow 3} \frac{\sqrt{x+1} - 2}{x-3}$$



Watch Video Solution

5. Complete the table use the result the estimate the limits

$$\lim_{x \rightarrow 0} \frac{\sin x}{x}$$



[Watch Video Solution](#)

6. Find the value of limit

$$\lim_{x \rightarrow 0} \frac{x(e^x - 1)}{1 - \cos x}$$



[Watch Video Solution](#)

7. Find the limits

$$\lim_{x \rightarrow 4} \frac{x^3 - 64}{x^2 - 16}$$



Watch Video Solution

8. Find the limits

$$\lim_{x \rightarrow 1} (x^2 + 2)$$



Watch Video Solution

9. Find the limits

$$\lim_{x \rightarrow 2} f(x) \text{ where } f(x) = \begin{cases} 4 - x & x \neq 2 \\ 0 & x = 2 \end{cases}$$



Watch Video Solution

10. Find the limits

$$\lim_{x \rightarrow 1} f(x) \text{ where } f(x) = \begin{cases} x^2 + 2 & x \neq 1 \\ 1 & x = 1 \end{cases}$$



Watch Video Solution

11. Find the limits

$$\lim_{x \rightarrow 3} \frac{1}{x - 3}$$



Watch Video Solution

12. Find the limits

$$\lim_{x \rightarrow 5} \frac{-|x - 5|}{(x - 5)}$$



Watch Video Solution

13. Find the limits

$$\lim_{x \rightarrow 1} (\pi x)$$



Watch Video Solution

14. Find the limits

$$\lim_{x \rightarrow 0} (\sec x)$$



Watch Video Solution

15. Find the limits

$$\lim_{x \rightarrow \frac{\pi}{2}} \tan x$$



Watch Video Solution

16. Sketch graph and identify the values of x for which $\lim f(x)$ exists.

$$f(x) = \begin{cases} x^2 & x \leq 2 \\ 8 - 2x & 2 < x < 4 \\ 4 & x \geq 4 \end{cases}$$



Watch Video Solution

17. Find the point of discontinuity of the function

$$f(x) = \begin{cases} \sin x & x < 0 \\ 1 - \cos x & 0 \leq x \leq \pi \\ \cos x & x > \pi \end{cases}$$



[Watch Video Solution](#)

18. Sketch the graph of a function f that satisfies the given values:

$$f(0) \text{ is undefined} \quad \lim_{x \rightarrow 0} f(x) = 4, \quad f(2) = 6,$$

$$\lim_{x \rightarrow 2} f(x) = 3$$



[Watch Video Solution](#)

19. Sketch the graph of a function f that satisfies the given values:

$$f(-2) = 0, \quad f(2) = 0, \quad \lim_{x \rightarrow -2} f(x) = 0, \quad ,$$

$$\lim_{x \rightarrow 2} f(x) \text{ does not exist.}$$



Watch Video Solution

20. Write a brief description of the meaning of the

notation $\lim_{x \rightarrow 8} f(x) = 25$



Watch Video Solution

21. If $f(2) = 4$, can you conclude anything about the limit of $f(x)$ as x approaches 2 ?



[Watch Video Solution](#)

22. If the limit of $f(x)$ as x approaches 2 is 4, can you conclude anything about $f(2)$? Explain reasoning,



[Watch Video Solution](#)

23. Evaluate : $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$ if it exists by finding $f(2^-)$ and $f(2^+)$



Watch Video Solution

24. Verify the existence of $\lim_{x \rightarrow 3} f(x)$, where

$$f(x) = \begin{cases} \frac{|x-3|}{x-3} & f \text{ or } x \neq 3 \\ 0 & f \text{ or } x = 3 \end{cases}$$



Watch Video Solution

Exercise 9 2

1. Evaluate the limits :

$$\lim_{x \rightarrow 2} \frac{x^4 - 16}{x - 2}$$



[Watch Video Solution](#)

2. Evaluate the limits :

$$\lim_{x \rightarrow 1} \frac{x^m - 1}{x^n - 1} \text{ m and n are integers}$$



[Watch Video Solution](#)

3. Evaluate the limits :

$$\lim_{\sqrt{x} \rightarrow 3} \frac{x^2 - 81}{\sqrt{x} - 3}$$



[Watch Video Solution](#)

 Watch Video Solution

4. Evaluate the limits :

$$\lim_{h \rightarrow 0} \frac{\sqrt{x+h} - \sqrt{x}}{h}, x > 0$$



Watch Video Solution

5. Evaluate the limits :

$$\lim_{x \rightarrow 5} \frac{\sqrt{x+4} - 3}{x-5}$$



Watch Video Solution

6. Evaluate the limits :

$$\lim_{x \rightarrow 2} \frac{\frac{1}{x} - \frac{1}{2}}{x - 2}$$



[Watch Video Solution](#)

7. Evaluate the limits :

$$\lim_{x \rightarrow 1} \frac{\sqrt{x} - x^2}{1 - \sqrt{x}}$$



[Watch Video Solution](#)

8. Evaluate the limits :

$$\lim_{x \rightarrow 0} \frac{\sqrt{x^2 + 1} - 1}{\sqrt{x^2 + 16} - 4}$$



[Watch Video Solution](#)

9. Evaluate the limits :

$$\lim_{x \rightarrow 0} \frac{\sqrt{1 + x} - 1}{x}$$



[Watch Video Solution](#)

10. Evaluate the limits :

$$\lim_{x \rightarrow 1} \frac{\sqrt{7 + x^3} - \sqrt{3 + 5x^2}}{x - 1}$$



[Watch Video Solution](#)

11. Evaluate the limits :

$$\lim_{x \rightarrow 2} \frac{2 - \sqrt{x + 2}}{\sqrt[3]{2} - \sqrt[3]{4 - x}}$$



[Watch Video Solution](#)

12. Evaluate the limits :

$$\lim_{x \rightarrow 0} \frac{\sqrt{1 + x^2} - 1}{x}$$



[Watch Video Solution](#)

13. Evaluate the limits :

$$\lim_{x \rightarrow 0} \frac{\sqrt{1-x} - 1}{x^2}$$



Watch Video Solution

14. Evaluate the limits :

$$\lim_{x \rightarrow 5} \frac{\sqrt{x-1} - 2}{x-5}$$



Watch Video Solution

15. Evaluate the limits :

$$\lim_{x \rightarrow a} \frac{\sqrt{x-b} - \sqrt{a-b}}{x^2 - a^2} \quad (a > b)$$



[View Text Solution](#)

Exercise 9 3

1. Find the left and right limits of

$$f(x) = \frac{x^2 - 4}{(x^2 + 4x + 4)(x + 3)} \text{ at } x = -2.$$



[Watch Video Solution](#)

2. Find the limit of $f(x) = \tan x$ at $x = \frac{\pi}{2}$.



[View Text Solution](#)

3. Evaluate

$$\lim_{x \rightarrow 3} \frac{x^2 - 9}{x^2(x^2 - 6x + 9)}$$



Watch Video Solution

4. Evaluate

$$\lim_{x \rightarrow \infty} \frac{3}{x - 2} - \frac{2x + 11}{x^2 + x - 6}$$



Watch Video Solution

5. Evaluate

$$\lim_{x \rightarrow \infty} \frac{x^3 + x}{x^4 - 3x^2 + 1}$$



Watch Video Solution

6. Evaluate

$$\lim_{x \rightarrow \infty} \frac{x^4 - 5x}{x^2 - 3x + 1}$$



Watch Video Solution

7. Evaluate

$$\lim_{x \rightarrow \infty} \frac{1 + x - 3x^3}{1 + x^2 + 3x^3}$$



Watch Video Solution

8. Evaluate

$$\lim_{x \rightarrow \infty} \left(\frac{x^3}{2x^2 - 1} - \frac{x^2}{2x + 1} \right)$$

 [Watch Video Solution](#)

9. Show that $\lim_{n \rightarrow \infty} \frac{1 + 2 + 3 + \dots + n}{3n^2 + 7n + 2} = \frac{1}{6}$

 [Watch Video Solution](#)

10. Show that

$$\lim_{n \rightarrow \infty} \frac{1^2 + 2^2 + \dots + (3n)^2}{(1 + 2 + \dots + 5n)(2n + 3)} = \frac{9}{25}$$

 [Watch Video Solution](#)

11. Show that

$$\lim_{n \rightarrow \infty} \frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots + \frac{1}{n(n+1)} = 1$$



[View Text Solution](#)

12. An important problem in fishery is to estimate the number of fish presently spawning in streams and use this information to predict the number of mature fish or "recruits" that will return to the rivers during the reproductive period. If S is the number of spawners and R the number of recruits,

" Beverton-Holt spawner recruit function" is $R(S) =$

$$\frac{S}{(\alpha S + \beta)}$$
 where α and β are positive constants,

Show that this function predicts approximately constant recruitment when the number of spawners is sufficiently large.



[Watch Video Solution](#)

13. A tank contains 5000 litres of pure water. Brine (very salt water) that contains 30 grams of salt per litre of water is pumped into the tank at a rate of 25 litres per minute. The concentration of salt water after t minutes (in grams per litre) is

$C(t) = \frac{30t}{200 + t}$. What happens to the concentration as $t \rightarrow \infty$

 [Watch Video Solution](#)

Exercise 9 4

1. Evaluate the limits

$$\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x} \right)^{7x}$$

 [Watch Video Solution](#)

2. Evaluate the limits

$$\lim_{x \rightarrow 0} (1 + x)^{1/3x}$$



Watch Video Solution

3. Evaluate the limits

$$\lim_{x \rightarrow \infty} \left(1 + \frac{k}{x}\right)^{mx}$$



Watch Video Solution

4. Evaluate the limits

$$\lim_{x \rightarrow \infty} \left(\frac{4x^2 + 5}{4x^2 + 8}\right)^{8x^2 + 5}$$



[Watch Video Solution](#)

5. Evaluate the limits

$$\lim_{x \rightarrow \infty} \left(1 + \frac{3}{x}\right)^{x+2}$$



[Watch Video Solution](#)

6. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{\sin^3\left(\frac{x}{2}\right)}{x^3}$$



[Watch Video Solution](#)

7. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{\sin ax}{\sin \beta x}$$



[Watch Video Solution](#)

8. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{\tan 2x}{\sin 5x}$$



[Watch Video Solution](#)

9. Evaluate the limits

$$\lim_{a \rightarrow 0} \frac{\sin(a^n)}{(\sin a)^m}$$



[Watch Video Solution](#)

 Watch Video Solution

10. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{\sin(a + x) - \sin(a - x)}{x}$$



Watch Video Solution

11. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{\sqrt{x^2 + a^2} - a}{\sqrt{x^2 + b^2} - b}$$



Watch Video Solution

12. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{2 \arcsin x}{3x}$$



Watch Video Solution

13. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$$



Watch Video Solution

14. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$$



Watch Video Solution

15. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{2^x - 3^x}{x}$$



Watch Video Solution

16. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{3^x - 1}{\sqrt{x + 1} - 1}$$



Watch Video Solution

17. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{1 - \cos^2 x}{x \sin 2x}$$



Watch Video Solution

18. Evaluate the limits

$$\lim_{x \rightarrow \infty} x \left[3^{\frac{1}{x}} + 1 - \cos \left(\frac{1}{x} \right) - e^{\frac{1}{x}} \right]$$



Watch Video Solution

19. Evaluate the limits

$$\lim_{x \rightarrow \infty} \{x[\log(x + a) - \log(x)]\}$$



Watch Video Solution

20. Evaluate the limits

$$\lim_{x \rightarrow \pi} \frac{\sin 3x}{\sin 2x}$$



Watch Video Solution

21. Evaluate the limits

$$\lim_{x \rightarrow 0} (1 + \sin x)^{2 \cos e cx}$$



Watch Video Solution

22. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{\sqrt{2} - \sqrt{1 + \cos x}}{\sin^2 x}$$



Watch Video Solution

23. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{\sqrt{1 + \sin x} - \sqrt{1 - \sin x}}{\tan x}$$



Watch Video Solution

24. Evaluate the limits

$$\lim_{x \rightarrow \infty} \left(\frac{x^2 - 2x + 1}{x^2 - 4x + 2} \right)^x$$



Watch Video Solution

25. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{e^x - e^{-x}}{\sin x}$$



Watch Video Solution

26. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{e^{ax} - e^{bx}}{x}$$



Watch Video Solution

27. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{\sin x(1 - \cos x)}{x^3}$$



Watch Video Solution

28. Evaluate the limits

$$\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^2}$$



Watch Video Solution

Exercise 9 5

1. Prove that $f(x) = 2x^2 + 3x - 5$ is continuous at all points in \mathbb{R} .



[Watch Video Solution](#)

2. Examine the continuity of the following:

$$x + \sin x$$



[Watch Video Solution](#)

3. Examine the continuity of the following:

$$x^2 \cos x$$

 **Watch Video Solution**

4. Examine the continuity of the following:

$$e^x \tan x$$

 **Watch Video Solution**

5. Examine the continuity of the following:

$$e^{2x} + x^2$$

 **Watch Video Solution**

6. Examine the continuity of the following:

$$x \cdot \ln x$$



Watch Video Solution

7. Examine the continuity of the following:

$$\frac{\sin x}{x^2}$$



Watch Video Solution

8. Examine the continuity of the following:

$$\frac{x^2 - 16}{x + 4}$$



[Watch Video Solution](#)

9. Examine the continuity of the following:

$$|x + 2| + |x - 1|$$



[View Text Solution](#)

10. Examine the continuity of the following:

$$\frac{|x - 2|}{|x + 1|}$$



[Watch Video Solution](#)

11. Examine the continuity of the following:

$$\cot x + \tan x$$



[Watch Video Solution](#)

12. Find the points of discontinuity of the function

f , where

$$f(x) = \begin{cases} 4x + 5 & \text{if } x \leq 3 \\ 4x - 5 & \text{if } x > 3 \end{cases}$$



[Watch Video Solution](#)

13. Find the points of discontinuity of the function

f , where

$$f(x) = \begin{cases} x + 2 & \text{if } x \geq 2 \\ x^2 & \text{if } x < 2 \end{cases}$$



[View Text Solution](#)

14. Find the points of discontinuity of the function

f , where

$$f(x) = \begin{cases} x^3 - 3 & \text{if } x \leq 2 \\ x^2 + 1 & \text{if } x > 2 \end{cases}$$



[Watch Video Solution](#)

15. Find the points of discontinuity of the function

f , where

$$f(x) = \begin{cases} \sin x & 0 \leq x \leq \frac{\pi}{4} \\ \cos x & \frac{\pi}{4} < x < \frac{\pi}{2} \end{cases}$$



Watch Video Solution

16. At the given point x_0 discover whether the given function is continuous or discontinuous citing the reasons for your answer.

$$x_0 = 1, f(x) = \begin{cases} \frac{x^2 - 1}{x - 1} & x \neq 1 \\ 2 & x = 1 \end{cases}$$



Watch Video Solution

17. At the given point x_0 discover whether the given function is continuous or discontinuous citing the reasons for your answer.

$$x_0 = 3, f(x) = \begin{cases} \frac{x^2 - 9}{x - 3} & x \neq 3 \\ 5 & x = 3 \end{cases}$$



[Watch Video Solution](#)

18. Show that the function $\begin{cases} \frac{x^3 - 1}{x - 1} & \text{if } x \neq 1 \\ 3 & \text{if } x = 1 \end{cases}$ is continuous on $(-\infty, \infty)$



[Watch Video Solution](#)

19. For what value of a is this function

$$f(x) \begin{cases} \frac{x^4-1}{x-1} & \text{if } x \neq 1 \\ a & \text{if } x = 1 \end{cases} \text{ continuous at } x=1?$$



[Watch Video Solution](#)

20. Graph the function. Show that $f(x)$ continuous on $(-\infty, \infty)$



[View Text Solution](#)

21. If f and g are continuous functions with $f(3)=5$ and $\lim_{x \rightarrow 3} [2f(x) - g(x)] = 4$, find $g(3)$.



Watch Video Solution

22. Find the points at which f is discontinuous . At which of these points f is continuous from the right, from the left, or neither? Sketch the graph of f .

$$f(x) = \begin{cases} 2x + 1 & \text{if } x \leq -1 \\ 3x & \text{if } -1 < x < 1 \\ 2x - 1 & \text{if } x \geq 1 \end{cases}$$



Watch Video Solution

23. Find the points at which f is discontinuous . At which of these points f is continuous from the

right, from the left, or neither? Sketch the graph of

f.

$$f(x) = \begin{cases} (x - 1)^3 & \text{if } x < 0 \\ (x + 1)^3 & \text{if } x > 0 \end{cases}$$



[Watch Video Solution](#)

24. A function f is defined as follows:

$$f(x) = \begin{cases} 0 & f \text{ or } x < 0 \\ x & f \text{ or } 0 \leq x < 1 \\ -x^2 + 4x - 2 & f \text{ or } 1 \leq x < 3 \\ 4 - x & f \text{ or } x \geq 3 \end{cases}$$



[View Text Solution](#)

25. Which of the following f has removable discontinuity at $x = x_0$? If the discontinuity is removable, find a function g that agrees with f for $x \neq x_0$ and is continuous on \mathbb{R} .

$$f(x) = \frac{x^2 - 2x - 8}{x + 2}, x_0 = -2$$



[Watch Video Solution](#)

26. Which of the following f has removable discontinuity at $x = x_0$? If the discontinuity is removable, find a function g that agrees with f for

$x \neq x_0$ and is continuous on \mathbb{R} .

$$f(x) = \frac{x^3 + 64}{x + 4}, x_0 = -4$$



Watch Video Solution

27. Which of the following f has removable discontinuity at $x = x_0$? If the discontinuity is removable, find a function g that agrees with f for $x \neq x_0$ and is continuous on \mathbb{R} .

$$f(x) = \frac{3 - \sqrt{x}}{9 - x}, x_0 = 9$$



Watch Video Solution

28. Find the constant b that makes g continuous

on $(-\infty, \infty)$

$$g(x) = \begin{cases} x^2 - b^2 & \text{if } x < 4 \\ bx + 20 & \text{if } x \geq 4 \end{cases}$$



Watch Video Solution

29. Consider the function $f(x) = x \sin\left(\frac{\pi}{x}\right)$. What

value must we give $f(0)$ in order to make the

function continuous everywhere?



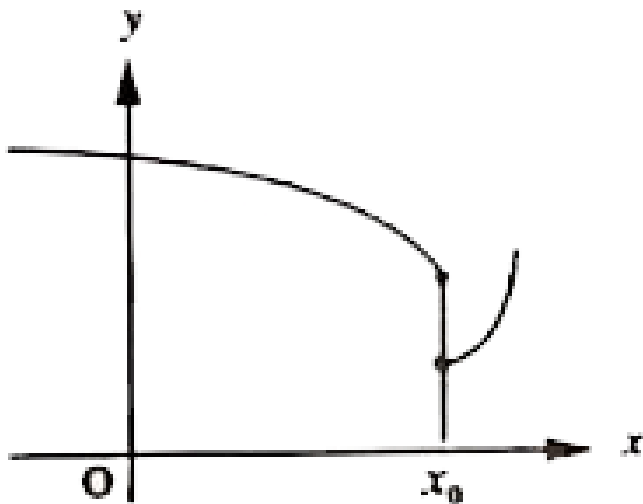
Watch Video Solution

30. The function $f(x) = \frac{x^2 - 1}{x^3 - 1}$ is not defined at $x=1$. What value must we give $f(1)$ in order to make $f(x)$ continuous at $x=1$?



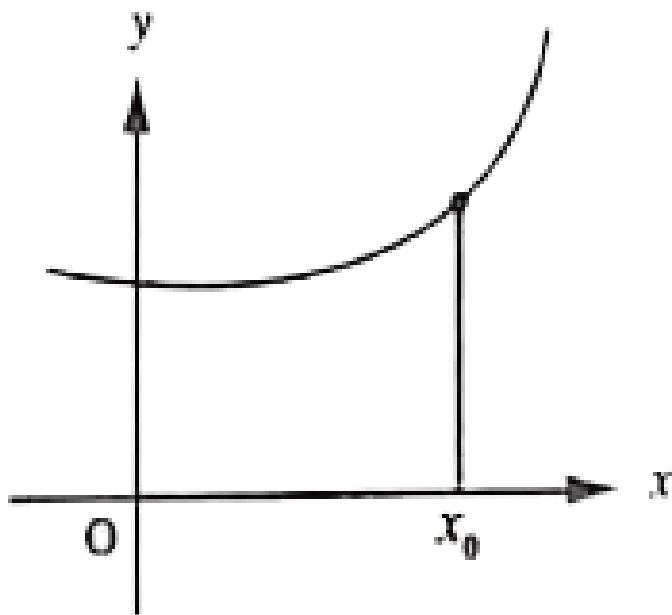
Watch Video Solution

31. State how continuity is destroyed at $x = x_0$ for each of the following graphs.



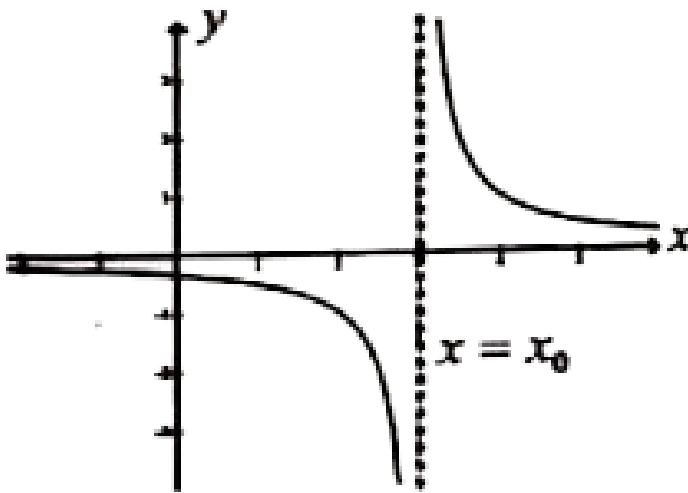
 [Watch Video Solution](#)

32. State how continuity is destroyed at $x = x_0$ for each of the following graphs.



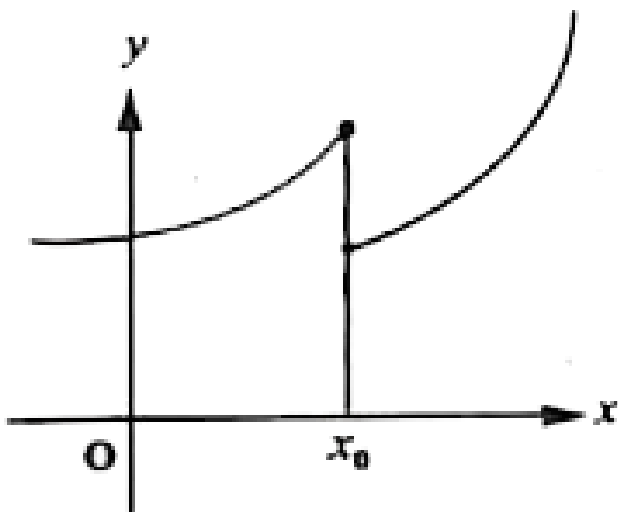
 [View Text Solution](#)

33. State how continuity is destroyed at $x = x_0$ for each of the following graphs.



Watch Video Solution

34. State how continuity is destroyed at $x = x_0$ for each of the following graphs.



Watch Video Solution

Exercise 9 6

1. $\lim_{x \rightarrow \infty} \frac{\sin x}{x} \dots$

A. 1

B. 0

C. ∞

D. $-\infty$

Answer: B



Watch Video Solution

2. $\lim_{x \rightarrow \frac{\pi}{2}} \frac{(2x - \pi)}{\cos x} \dots\dots\dots$

A. 2

B. 1

C. -2

D. 0

Answer: C



Watch Video Solution

3. $\lim_{x \rightarrow 0} \frac{\sqrt{1 + \cos 2x}}{x} \dots\dots$

A. 0

B. 1

C. 2

D. $\sqrt{2}$

Answer: D



Watch Video Solution

4. $\lim_{\theta \rightarrow 0} \frac{\sin \sqrt{\theta}}{\sqrt{\sin \theta}} \dots\dots$

A. 1

B. -1

C. 0

D. 2

Answer: A



Watch Video Solution

5. $\lim_{x \rightarrow \infty} \left(\frac{x^2 + 5x + 3}{x^2 + x + 3} \right)^x$ is.....

A. e^4

B. e^2

C. e^3

D. 1

Answer: A



View Text Solution

6. $\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 1}}{2x + 1} \dots\dots$

A. 1

B. 0

C. -1

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

Answer: D



Watch Video Solution

7. $\lim_{x \rightarrow \infty} \frac{a^x - b^x}{x} \dots\dots\dots$

A. $\log ab$

B. $\log\left(\frac{a}{b}\right)$

C. $\log\left(\frac{b}{a}\right)$

D. $\frac{a}{b}$

Answer: B



Watch Video Solution

8. $\lim_{x \rightarrow 0} \frac{8^x - 4^x - 2^x + 1}{x^2} \dots\dots\dots$

A. $2\log 2$

B. $2(\log 2)^2$

C. $\log 2$

D. $3 \log 2$

Answer: B



Watch Video Solution

9. If $f(x) = x(-1) \left[\frac{1}{x} \right] x \leq 0$, then the value of

$\lim_{x \rightarrow 0} f(x)$ is equal to

A. -1

B. 0

C. 2

D. 4

Answer: B



Watch Video Solution

10. $\lim_{x \rightarrow 3} |x| = \dots\dots\dots$

A. 2

B. 3

C. does not exist

D. 0

Answer: C



Watch Video Solution

11. Let the function f be defined

$$f(x) = \begin{cases} 3x & 0 \leq x \leq 1 \\ -3x + 5 & 1 < x \leq 2 \end{cases} \text{ then.....}$$

A. $\lim_{x \rightarrow 1} f(x) = 1$

B. $\lim_{x \rightarrow 1} f(x) = 3$

C. $\lim_{x \rightarrow 1} f(x) = 2$

D. $\lim_{x \rightarrow 1} f(x) =$ does not exist

Answer: D



Watch Video Solution

12. If $f: R \rightarrow R$ is defined by

$$f(x) = \lfloor x - 3 \rfloor + \lfloor x - 4 \rfloor \text{ for } x \text{ in } R \text{ then}$$

$\lim_{x \rightarrow 3^-} f(x)$ is equal to

A. -2

B. -3

C. 0

D. 1

Answer: B



Watch Video Solution

 Watch Video Solution

13. $\lim_{x \rightarrow 0} \frac{xe^x - \sin x}{x}$ is.....

A. 1

B. 2

C. 3

D. 0

Answer: D



Watch Video Solution

14. If $\lim_{x \rightarrow 0} \frac{\sin px}{\tan 3x} = 4$ then the value of p is.....

A. 6

B. 9

C. 12

D. 4

Answer: C



Watch Video Solution

15. $\lim_{a \rightarrow \pi/4} \frac{\sin a - \cos a}{a - \pi/4}$ is.....

A. $\sqrt{2}$

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

C. 1

D. 2

Answer: A



Watch Video Solution

16.

$$\lim_{n \rightarrow \infty} \left(\frac{1}{n^2} + \frac{2}{n^2} + \frac{3}{n^2} + \frac{4}{n^2} + \dots + \frac{n}{n^2} \right) \dots \dots$$

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

B. 0

C. 1

D. ∞

Answer: A



Watch Video Solution

17. $\lim_{x \rightarrow 0} \frac{e^{\sin x} - 1}{x} = \dots\dots$

A. 1

B. e

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

D. 0

Answer: A



Watch Video Solution

18. $\lim_{x \rightarrow 0} \frac{e^{\sin x} - e^x}{\sin x - x} \dots\dots\dots$

A. 1

B. e

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

D. 0

Answer: A



Watch Video Solution

19. The value of $\lim_{x \rightarrow 0} \frac{\sin x}{\sqrt{x^2}}$ is.....

A. 1

B. -1

C. 0

D. ∞

Answer: D



Watch Video Solution

20. The value of $\lim_{x \rightarrow k^-} x - [x]$, where k is an integer is.....

A. -1

B. 1

C. 0

D. 2

Answer: B



Watch Video Solution

21. At $x = \frac{3}{2}$ the function $f(x) = \frac{|2x - 3|}{2x - 3}$

is.....

- A. Continuous
- B. discontinuous
- C. Differentiable
- D. non zero

Answer: B



Watch Video Solution

22. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by

$$f(x) = \begin{cases} x & x \text{ is irrational} \\ 1 - x & x \text{ is rational} \end{cases} \text{ then } f \text{ is.....}$$

A. Discontinuous at $x = \frac{1}{2}$

B. Continuous at $x = \frac{1}{2}$

C. Continuous everywhere

D. Discontinuous everywhere

Answer: B



Watch Video Solution

23. The function $f(x) = \begin{cases} \frac{x^2-1}{x^3+1} & x \neq -1 \\ P & x = -1 \end{cases}$ is not

defined for $x=-1$. The value of $f(-1)$ so that the function extended by this value is continuous is.....

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

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

C. 1

D. 0

Answer: B



Watch Video Solution

24. Let f be a continuous function on $[2, 5]$. If f takes only rational values for all x and $f(3)=12$. then $f(4.5)$ is equal to.....

A. $\frac{f(3) + f(4.5)}{7.5}$

B. 12

C. 17.5

D. $\frac{f(4.5) + f(3)}{1.5}$

Answer: B



Watch Video Solution

25. Let a function f be defined by

$$f(x) = \frac{x - |x|}{x} f \text{ or } x \neq 0 \text{ and } f(0)=2. \text{ Then } f \text{ is}$$

- A. Continuous no where
- B. Continuous everywhere
- C. Continuous for all x except $x=1$
- D. Continuous for all x except $x=0$

Answer: D



Watch Video Solution