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## MATHS

# BOOKS - CHHAYA PUBLICATION MATHS (BENGALI <br> ENGLISH) 

## CONTINUITY AND DIFFERENTIABILITY

## lifustrative Examples

1. Prove that the function $f(x)=5$ is continuous at $x=2$.

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2. Show that the function $f(x)=x^{2}+2 x$ is continuous for every real value of $x$.
3. Examine the continutiy of $f(x)$ at $x=1$, where $f(x)= \begin{cases}\frac{|x-1|}{x-1} & \text { when } x \neq 1 \\ 0 & \text { when } x=1\end{cases}$

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4. Examine the continuity of the function
$f(x)=\left\{\begin{array}{cc}\frac{|\sin x|}{x} & \text { when } x \neq 0 \\ 1 & \text { when } x=0\end{array}\right.$

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5. Given that, $f(x)= \begin{cases}\frac{1-\cos 4 x}{x^{2}} & \text { if } x<0 \\ \mathrm{a} & \text { if } x=0 \\ \frac{\sqrt{x}}{\sqrt{16+\sqrt{x}}-4} & \text { if } x>0\end{cases}$

If $f(x)$ is continuous at $x=0$, find the value of a

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6. A function $\phi(x)$ is defined as follows: $\phi(x)= \begin{cases}\frac{\tan 4 x}{5 x} & \text { when } x \neq 0 \\ \frac{5}{4} & \text { when } x=0\end{cases}$

Examine the cotinuity of $\phi(x) a t x=0$.

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7. Show that the function $f(x)=\left\{\begin{array}{ll}x \cos \frac{1}{x} & \text { when } x \neq 0 \\ 0 & \text { when } x=0\end{array}\right.$ is continuous at $\mathrm{x}=0$.

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8. The function $f(x)=\frac{2 x^{2}-8}{x-2}$ is undefined at $\mathrm{x}=2$. What value must be assigned to $f(2)$, if $f(x)$ is to be cotinuous at $x=2$ ?

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9. $f(x)=\frac{1}{x}[\log (1+b x)-\log (1-a x)]$ is not defined at $\mathrm{x}=0$. What value is to be assigned to $f(0)$ so that $f(x)$ will be continuous at $x=0$ ?

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10. The function $f(x)=\frac{x^{3}-8}{x^{2}-4}$ is undefined at $\mathrm{x}=2$. Redefine the function so as to make it cotinuous at $\mathrm{x}=2$.

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11. Find the points of discontinuity of the following functions:

$$
\frac{x^{2}-3 x+5}{x^{3}-2 x^{2}-5 x+6}
$$

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12. Find the points of discontinuity of the following functions:

$$
\frac{1}{\sin \theta-\cos \theta}
$$

13. A function $f(x)$ is defined as follows:
$f(x)=\left\{\begin{array}{ll}x+2 & \text { when } \\ x^{2}-1<2 & \text { when }\end{array} x \geq 2\right.$
Show that $\mathrm{f}(\mathrm{x})$ is discontinuous at $\mathrm{x}=2$ and the jump of the function at this point is -1 .

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14. Find the values of $a$ and $b$ such that the function $f(x)$ defined by
$f(x)= \begin{cases}x+a \sqrt{2} \sin x & 0 \leq x<\frac{\pi}{4} \\ 2 x \cot x+b & \frac{\pi}{4} \leq x \leq \frac{\pi}{2} \\ a \cos 2 x-b \sin x & \frac{\pi}{2}<x \leq \pi\end{cases}$
is continuous for all values of x in $0 \leq x \leq \pi$.

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15. If the following function $f(x)$ is continuous at $x=0$, find the values of $a$, b and c , where

$$
\left\{\begin{array}{cl}
\frac{\sin (a+1) x+\sin x}{x} & \text { if } x<0 \\
c & \text { if } x=0 \\
\frac{\sqrt{x+b x^{2}}-\sqrt{x}}{b x^{\frac{3}{2}}} & \text { if } x>0
\end{array}\right.
$$

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16. If $f(x)=\left\{\begin{array}{ll}\frac{\left(1-\sin ^{3} x\right)}{3 \cos ^{2} x} & x<\frac{\pi}{2} \\ a & x=\frac{\pi}{2} \\ \frac{b(1-\sin x)}{(\pi-2 x)^{2}} & x>\frac{\pi}{2}\end{array}\right.$ is continuous at $x=\frac{\pi}{2}$, then the value of $\left(\frac{b}{a}\right)^{\frac{1}{3}}$ is

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17. If $\mathrm{n}=$ any integer, show that the function $f(x)=[x]+[-x]$ has removable discontinuity at $\mathrm{x}=\mathrm{n}$, here $[\mathrm{x}]$ denotes greatest integer function.

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18. Let $f(x+y)=f(x)+f(y)$ for all real x and y . If $\mathrm{f}(\mathrm{x})$ is continuous at $x=0$, show it is continuous for all real values of $x$.

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19. Using first principle , find the derivative of $\log _{10} x$ w.r.t. x .

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20. Find from the definition, the derivatives of
$e^{4 x}$ at $x=0$

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21. Find from the definition, the derivatives of
$\log x$ at $x=2$
22. From first principle find the derivatives of each of the following functions w.r.t.x:
$\tan ^{-1} x$

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23. From first principle find the derivatives of each of the following functions w.r.t.x:
$\log (\sin x)$

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24. From first principle find the derivatives of each of the following
functions w.r.t.x:
$\cos (\log x)$
25. Find from definition the derivatives of
$x^{2} e^{x}$

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26. Find from definition the derivatives of
$e^{\sqrt{\cot x}}$

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27. Differentiate the following functions with respect to x :
$2 x^{4}-\frac{4}{\sqrt[4]{x^{3}}}+\frac{3 x^{2}}{\sqrt[3]{x}}-5$

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28. Differentiate the following functions with respect to x :
$2 \log _{3} x-e^{2 \log x}+e^{2+x}$
29. Find the derivatives of the following functions w.r.t $\times$ (or,u):
$5^{x} . x^{5}$

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30. Find the derivatives of the following functions w.r.t $\times$ (or $u$ ):
$\left(u^{3}+3^{u}\right) \operatorname{cosec} u$

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31. Find the derivative of the following function w.r.t.x:
$y=\frac{\sin x}{\log x}$

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32. Examine the continuity and differentiability of $f(x)=2 x^{2}+1$ at $x=1$.

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33. A function $f(x)$ is defined as follows:
$f(x)= \begin{cases}x & \text { when } x \geq 0 \\ -x & \text { when } x<0\end{cases}$
Examine the cotinuity and differentiability of $(x)$ at $x=0$.

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34. A function $f$ (x) is defined as follows :
$f(x)= \begin{cases}5+2 x & \text { when }-\frac{5}{2}<x \leq 0 \\ 5-2 x & \text { when } 0<x<\frac{5}{2}\end{cases}$
Examine the continuity and differentiability of $f(x)$ at $x=0$

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35. 

$f(x)=|x+2|-1$, evalute $\lim _{x \rightarrow-2+} \frac{f(x)-f(-2)}{x+2}$ and $\lim _{x \rightarrow-2-} \underline{f(x)}$
.What can you say about the existence of $f^{\prime}(x)$ at $x=-2$ ?

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36. Let $f(x)= \begin{cases}\frac{1}{x^{2}} \sin \left(x^{2}\right) & \text { when } x \neq 0 \\ 0 & \text { when } x=0\end{cases}$

Discuss the continuity of $f(x)$ at $x=0$.

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37. Find the cofficients $a$ and $b$ such that the following function $f$ is continuous and differentiable at $x= \pm 1$ :
$f(x)= \begin{cases}\frac{1}{|x|} & \text { when } \\ |x| \geq 1 \\ a x^{2}+b & \text { when } \\ |x|<1\end{cases}$
38. Prove that the function $f(x)=\sin \pi|x|$ is continuous at $\mathrm{x}=0$ but not differntiable at the same point.

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39. If $g(x)$ is the inverse of $f(x)$ and $f(x)=\frac{1}{1+x^{3}}$, then find $g(x)$.

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## Exercise 2 A Multiple Choice Type Questions

1. The function $f(x)$ is continuous at $x=0$ of -
A. $\lim _{x \rightarrow 0} f(x)$ exists
B. $f(0)$ infinite
C. $\lim _{x \rightarrow 0} f(x)=f(0)$
D. $\lim _{x \rightarrow 0+} f(x)=\lim _{x \rightarrow 0-} f(x)$

## Answer: C

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2. The function $f(x)=|x|$ is -
A. continuous for all real values of $x$
B. discontinuous at $\mathrm{x}=0$
C. continuous only at $\mathrm{x}=0$
D. none of these

## Answer: A

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3. The greatest integer function $f(x)=[x]$ is -
A. continuous for all real values of $x$
B. continuous only at non-integral values of $x$
C. continuous at integral values of $x$
D. none of these

## Answer: B

## D Watch Video Solution

4. The function $f(x)=x^{k}$ is continuous at $\mathrm{x}=\mathrm{k}$ when -
A. $k \neq 0$
B. $k<0$
C. $k \leq 0$
D. $k \geq 0$

## Answer: D

5. The points of discontinuties of the function $f(x)=\frac{x+2}{2 x^{2}-x-1}$ are -
A. $\frac{1}{2},-1$
B. $-\frac{1}{2},-1$
C. $1-\frac{1}{2}$
D. $\frac{1}{2}, 1$

## Answer: C

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6. The function $f(x)=\frac{\sin x}{\sin x-\cos x}$ is discontinuous at -

## Exercise 2 A Very Short Answer Type Questions

1. Define the discontinuity of $f(x)$ at $x=a$
2. Define the continuity of $f(x)$ at $x=a$. When is the function said to be continuous in the closed interval $a \leq x \leq b$ ?

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3. Show that the following functions are continuous at every real x :
k (a constant )

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4. Show that the following functions are continuous at every real x :
$2 x+5$

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5. Show that the following functions are continuous at every real x : $3 x^{2}-5 x+9$

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6. Show that the following functions are continuous at every real x :
$\cos x$

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7. Show that the following functions are continuous at every real x :
$x^{2}+\sin x$

## - Watch Video Solution

8. Show that the following functions are continuous at every real x :
$3 x^{2}-5 x+9$
9. Show that the function $f(x)=5 x-|2 x|$ is continuous at $\mathrm{x}=0$

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10. Examine the continuity of the following function at $\mathrm{x}=0$ :
$\phi(x)=\left\{\begin{array}{lr}\frac{|2 x|}{x} & \text { when } x \neq 0 \\ 0 & \text { when } \quad x=0\end{array}\right.$

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11. Find the value of k for which the function
$f(x)=\left\{\begin{array}{ll}k x+4 & \text { when } x \leq \pi \\ \cos x & \text { when } x>\pi\end{array}\right.$,
is continuous at $x=\pi$.

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12. Find the value of k for which the function
$f(x)=\left\{\begin{array}{ll}k x+2 & \text { when } x \leq \pi \\ \cos x & \text { when } x>\pi\end{array}\right.$,
is continuous at $x=\pi$.

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13. Let $f(x)=\left\{\begin{array}{ll}2 x+1 & \text { when } x<2 \\ k+2 & \text { when } x=2 \\ 4 x-3 & \text { when } x>2\end{array}\right.$ Find the value of k for which $\mathrm{f}(\mathrm{x})$ is continuous at $\mathrm{x}=2$.

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14. Indicate the points of discontinuity of the following functions:

$$
\frac{x+2}{x^{2}-2 x-3}
$$

15. Indicate the points of discontinuity of the following functions:
$\frac{3 x^{2}-4 x}{x^{3}+x^{2}-x-1}$

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16. Indicate the points of discontinuity of the following functions:
$\frac{1}{\sin x+\cos x}$.

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## Exercise 2 A Short Answer Type Questions

1. A function $f(x)$ is defined as follows:
$f(x)= \begin{cases}x^{4}-3 & \text { when } x \leq 2 \\ x^{3}+5 & \text { when } x>2\end{cases}$
Prove that the function $f(x)$ is continuous at $x=2$.
2. The definition of the function $f(x)$ is given below: $f(x)= \begin{cases}\frac{1}{2}-x & \text { when } x<3 \\ 1 & \text { when } x=3 \\ x-\frac{1}{2} & \text { when } x>3\end{cases}$
Calculate $f(3-0), f(3+0), f(3)$ and state whether $f(x)$ is continuous at $x=3$ or not.

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3. A function $f(x)$ is defined as follows:

$$
\begin{cases}5+2 x & \text { for }-\frac{5}{2} \leq x<0 \\ 5-2 x & \text { for } 0 \leq x<\frac{5}{2} \\ -5-2 x & \text { for } x \geq \frac{5}{2}\end{cases}
$$

Show that $\mathrm{f}(\mathrm{x})$ is continuous at $\mathrm{x}=0$ and discontinuous at $x=\frac{5}{2}$.

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4. Given, $f(x)= \begin{cases}\frac{1-\cos 3 x}{x^{2}} & \text { when } x \neq 0 \\ 1 & \text { when } x=0\end{cases}$

Prove that $f(x)$ is discontinuous at $x=0$.
5. For what value of $\mathrm{f}(4)$ the function $f(x)=\frac{x^{2}-16}{x-4}$ is continuous at x $=4$ ?

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6. The function $f(x)=\frac{x^{2}-4}{x^{3}-8}$ is undefined at $x=1$, what should be the value of $f(1)$ such that $f(x)$ may be continuous at $x=1$ ?

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7. Differentiate $(2 x-1)\left(3 x^{2}+2\right)$ in the way mentioned below:
by using product rule

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8. The function $f(x)=\frac{1}{x}[\log (1+5 x)-\log (1+3 x)]$ is undefined at $\mathrm{x}=$

0 . What value must be assigned to $f(0)$ if $f(x)$ is to be continuous at $x=0$

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## Exercise 2 A Long Answer Type Questions

1. Given, $f(x)= \begin{cases}\frac{\sin 5 x}{3 x} & \text { when } x \neq 0 \\ \frac{3}{5} & \text { when } x=0\end{cases}$

Examine the cotinuity of $f(x)$ at $x=0$.

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2. Let $f(x)=\left\{\begin{array}{cc}\frac{x^{2}}{2} & \text { when } 0 \leq x<1 \\ 2 x^{2}-3 x+\frac{3}{2} & \text { when } 1 \leq x \leq 2\end{array}\right.$

Discuss the continuity of ( x ) in the interval $0 \leq x \leq 2$.
3. Show that function $f(x)=2 x-|x|$ is continous at $x=0$.

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4. Test the continuity of the function $f(x)$ :
$f(x)= \begin{cases}x^{2} \sin \cdot \frac{1}{x} & \text { when } x \neq 0 \\ 0 & \text { when } x=0\end{cases}$

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5. A function $\mathrm{f}(\mathrm{x})$ is defined as follows: $f(x)=\left\{\begin{array}{lll}3 x+1 & \text { for } & x \leq 1 \\ 3-a x^{2} & \text { for } & x>1\end{array}\right.$ If $f(x)$ is continuous at $x=1$, find the value of a.

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6. A function $f(x)$ is defined as
$f(x)=\left\{\begin{array}{l}a x+2 \text { when } x \leq 3 \\ b x+3 \text { when } x>3\end{array}\right.$
If $f(x)$ is continuous at $x=3$ then find the relation between $a$ and $b$.

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7. Let $f(x)=\left\{\begin{array}{cl}\frac{x^{3}+x^{2}-16 x+20}{(x-2)^{2}} & \text { when } x \neq 2 \\ k & \text { when } x=2\end{array}\right.$
if $f(x)$ is continuous for all $x$, find $k$.

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8. Let $f(x)=\left\{\begin{array}{cl}\frac{1-\cos 2 a x}{x \sin 2 x} & \text { when } x \neq 0 \\ \frac{1}{2} & \text { when } x=0\end{array}\right.$ If $\mathrm{f}(\mathrm{x})$ is continuous at $\mathrm{x}=0$, find the value of $\alpha$.

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9. If the following function $f(x)$ is continuous at $x=0$, find $k$ :
$f(x)=\left\{\begin{array}{cc}\frac{1-\cos 2 m x}{2 x^{2}} & \text { when } x \neq 0 \\ k & \text { when } x=0\end{array}\right.$
10. The function $f(x)=\frac{x^{3}-1}{x-1}$ is undefined at $\mathrm{x}=1$. Redefine the function so as to makeit continuous at $\mathrm{x}=1$.

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11. Show that the function $f(x)=\left\{\begin{array}{cc}x+\frac{x+2}{|x+2|} & \text { when } x \neq-2 \\ -1 & \text { when } x=-2\end{array}\right.$ is dicontinuous at $x=-2$ Also find the jump of $f(x)$ at this point of discontinuity.

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12. If the function $f(x)=\left\{\begin{array}{cl}3 a x+b & \text { for } x>1 \\ 11 & \text { when } x=1 \\ 5 a x-2 b & \text { for } x<1\end{array}\right.$ is continuous at $x=1$, find the values of $a$ and $b$.

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13. Let $f(x)=\left\{\begin{array}{ll}\frac{1-\sin ^{3} x}{3 \cos ^{2} x} & \text { if } x<\frac{\pi}{2} \\ a & \text { if } x=\frac{\pi}{2} \\ \frac{b(1-\sin x)}{(\pi-2 x)^{2}} & \text { if } x>\frac{\pi}{2}\end{array}\right.$,
if $\mathrm{f}(\mathrm{x})$ is continuous at $x=\frac{\pi}{2}$, find a and b .

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14. Let $f(x)=\left\{\begin{array}{cl}\frac{\sin (a+1) x+\sin x}{x}, & \text { when } x<0 \\ \mathrm{c}, & \text { when } x=0 \\ \frac{\left(x+b x^{2}\right)^{\frac{1}{2}}-x^{\frac{1}{2}}}{b x^{\frac{3}{2}}}, & \text { when } x>0\end{array}\right.$

If $f(x)$ is continuous at $x=0$, determine the values of $a, b$ and $c$.

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15. Show that the function $f(x)=|\sin x+\cos x|$ is continuous at $x=\pi$.

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16. Show that the function $g(x)=x-[x]$ is discontinuous at all integral points. Here $[\mathrm{x}]$ denotes the greatest integer function.

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17. Find from the first principle, the derivatives of the following functions w.r.t.x: $\sin ^{-1} x$

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18. Find from the first principle, the derivatives of the following functions w.r.t.x: $\cos ^{-1} x$
19. Find from the first principle, the derivatives of the following functions w.r.t.x:
$e^{\sqrt{x}}$

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20. Find from the first principle, the derivatives of the following functions w.r.t.x:
$\log (\cos x)$

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21. Find from the first principle, the derivatives of the following functions w.r.t.x: $\sin (\log x)$
22. Find from the first principle, the derivatives of the following functions w.r.t.x:

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23. Find from the first principle, the derivatives of the following functions w.r.t.x:
$e^{\sqrt{\tan 2 x}}$

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24. $f(x)= \begin{cases}x^{2}-2 x+3 & \text { for } \quad x<1 \\ 2 & \text { for } \quad x=1 \\ 2 x^{2}-5 x+5 & \text { for } \quad x>1\end{cases}$

Examine the continuity and differentibility of the function $f(x)$ at $x=1$.

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25. A function $\mathrm{f}(\mathrm{x})$ is defined as follows :
$f(x)=\left\{\begin{array}{lll}2-x, & \text { when } & x<1 \\ x^{2}-3 x, & \text { when } & x \geq 1\end{array}\right.$
Examine the differentiability of the function $f(x)$ at $x=1$, hence state whether $f(x)$ is continuous at $x=1$ or not .

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26. If the function $f(x)$ defined below is differentiable at $x=1$ then find the values of $p$ and $q$.
$f(x)=\left\{\begin{array}{lll}x^{2}+3 x+p, & \text { when } & x \leq 1 \\ q x+3, & \text { when } & x>1\end{array}\right.$

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27. If the function
$f(x)=\left\{\begin{array}{lll}2 x+3, & \text { when } \quad x \leq 1 \\ a x^{2}+b x, & \text { when } \quad x>1\end{array}\right.$
is differentiable everywhere then show that $f^{\prime}(3)=-10$
28. If $\mathrm{f}(\mathrm{x})$ is an even function and $\mathrm{f}^{\prime}(0)$ exists, show that $f^{\prime}(0)=0$.

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## Exercise 2 A Multiple Choice Type Questions

1. State which of the following statements is true?
A. The function $f(x)=\log _{e} x$ is differentiable for all real x
B. If the function $f(x)$ is continuous at $x=a$, then $f(x)$ is differentible at $\mathrm{x}=\mathrm{a}$
C. If the function $f(x)$ is differentibele at $x=a$, then $f(x)$ is continuous at $x=a$
D. none of these

## Answer: C

2. The function $f(x)=|x+1|-$
A. continuous at $x=-1$
B. differntiable at $x=1$
C. differntiable at $x= \pm 1$
D. none of these

## Answer: A

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## Exercise 2 A Very Short Answer Type Questions

1. Find from the first principle, the derivatives of the following functions: $e^{3 x}$
2. Find from the first principle, the derivatives of the following functions: $\log _{3} x$

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3. Find from definition the differntial cofficients of the following .
$e^{\frac{x}{2}} \quad$ at $\quad x=-2$

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4. Find from definition the differntial cofficients of the following . $e^{-2 x}$ at $x=0$

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5. Examine whether $f(x)=|2 x|$ has a derivative at $\mathrm{x}=0$
6. Prove that $f(x)=5 x-3$ is continuous at $x=0$

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## Exercise 2 A Short Answer Type Questions

1. Show that the function $f(x)=x|x|$ is continuous and differentiable at
$x=0$

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2. $f(x)= \begin{cases}5 x-4 & \text { when } 0<x \leq 1 \\ 4 x^{2}-3 x & \text { when } x>1\end{cases}$

Discuss the continuity and differentiability of $f(x)$ at $x=1$

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3. $f(x)=\left\{\begin{array}{cc}2 & \text { when } x<0 \\ 2+\sin x & \text { when } x \geq 0\end{array}\right.$

Show that $f(x)$ is continuous at $x=0$ but $f^{\prime}(0)$ does not exist.

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4. Examine the continuity and differentiability of the function $f(x)=|\sin x| a t x=0$.

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5. Examine the continuity and differentiability of the function $f(x)=3 x+|x-1|$ at $\quad x=1$

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Sample Questions For Competitive Examination Mutiple Correct Answers Type

1. $f(x)=\left\{\begin{array}{ll}\frac{1}{5}\left(2 x^{2}+3\right), & \text { for }-\infty<x \leq 1 \\ 6-5 x, & \text { for } 1<x<3 \\ x-2, & \text { for } 3 \leq x<\infty\end{array}\right.$, then f is -
A. continuous at $x=1$
B. discontinuous at $\mathrm{x}=1$
C. continuous at $\mathrm{x}=3$
D. discontinuous at $\mathrm{x}=3$

## Answer: A: D

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2. If $f(x)=[x \sin (\pi x)]$ ( where $[\mathrm{x}]$ is the greatest integer function ), then $f(x)$ is -
A. continuous at 0
B. continuous in $(0,1)$
C. derivable at 1
D. none of these

## Answer: A::B

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3. Let $f(x)=\min \left\{x, x^{2}\right\}$ (where $\{x\}=x-[x]$, where $[x]$ denotes the greatest integer function ), then -
A. f is comtinuous for all $x \in \mathbb{R}$,
B. f is derivable for all $x \in \mathbb{R}$
C. f is derivable for all x except 0,1
D. none of these

## Answer: A::C

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4. If $f(x)=x^{3} \operatorname{sgn} x$ then-
A. $f$ is derivable at 0
B. $L^{\prime}(0)=1$
C. $R f^{\prime}(0)=0$
D. none of these

## Answer: A: C

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5. Let $f(x)=|\log | x| |$, then-
A. domain of $f=(0, \infty)$
B. domain of $f=\mathbb{R}-\{0\}$
C. $f$ is a continuous function
D. f is not differentiable at-1, 1

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Sample Questions For Competitive Examination Integer Answer Type

1. Find the value of $f(0)$ for which $f(x)=\frac{64(\sqrt{x+4}-2)}{\sin 2 x}$ continuous.

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2. Find the number of integral discontinuities of
$f(x)=\frac{\tan x \quad \tan ^{-1}\left(\frac{1}{x}-1\right)}{x(x-2)(x-4)}$

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3. Find the number of points where $f$ is continuous:
$f(x)=x, x \in \mathbb{Q}$ and $f(x)=1-x, x \in \mathbb{R} \sim \mathbb{Q}$

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4. 

$f(\theta)=\sin \left(\tan ^{-1}\left(\frac{\sin \theta}{\sqrt{\cos 2 \theta}}\right)\right)$, where $-\frac{\pi}{4}<\theta<\frac{\pi}{4}$, then the valueof is -

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5. A continuous function $f: \mathbb{R} \rightarrow \mathbb{R}$ satisfies relation $f(x)+f(2 x+y)+5 x y=f(3 x-y)+2 x^{2}+1$ for all $x, y \in \mathbb{R}$, then the value of $|f(4)|$ is equal to -

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Sample Questions For Competitive Examination Matric Match Type

1. Check whether the function $\frac{4 x^{2}-1}{2 x-1}$ is continuous or not?

## Sample Questions For Competitive Examination

1. Differentiate $\left(5 x^{2}+1\right)(3 x-5)$ in the way mentioned below: by using product rule

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## Sample Questions For Competitive Examination Comprepension Type

1. 

Given
$f(x)=x^{2}+a x+3, g(x)=x+b$ and $f(x)=\lim _{n \rightarrow \infty} \frac{f(x)+x^{2 n} g(x)}{1+x^{2 n}}$
If $F(x)$ is continuous at $x=1$, then -
A. $b=a+3$
B. $b=a-1$
C. $a=b-2$
D. $a=b+3$

## Answer: A

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2. 

Given
$f(x)=x^{2}+a x+3, g(x)=x+b$ and $f(x)=\lim _{n \rightarrow \infty} \frac{f(x)+x^{2 n} g(x)}{1+x^{2 n}}$ If $\mathrm{F}(\mathrm{x})$ is continuous at $x=-1$, then -
A. $a+b=-2$
B. $a-b=3$
C. $a+b=5$
D. $a-b=2$

## Answer: C

$f(x)=x^{2}+a x+3, g(x)=x+b$ and $f(x)=\lim _{n \rightarrow \infty} \frac{f(x)+x^{2 n} g(x)}{1+x^{2 n}}$ If $\mathrm{F}(\mathrm{x})$ is continuous at $x= \pm 1$, then $\mathrm{g}(\mathrm{x})=\mathrm{f}(\mathrm{x})$ has -
A. imaginary roots
B. both the roots positive
C. both the roots negative
D. roots of opposite signs

## Answer: D

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4. Let $f(x)=\left\{\left\{:([x] ", ",-2 l e x l e-(1) /(2)),\left(2 x^{\wedge}(2)-1 ",,-(1) /(2)|t x| e 2\right):\right\} " \quad\right.$ and
" $g(x)=f(|x|)+|f(x)|$
 $|f(x)|^{\prime}$ is non -differentiable is -
A. 3
B. 4
C. 2
D. 5

## Answer: A

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5. Let $f(x)=\left\{\left\{:([x] ", ",-2 l e x l e-(1) /(2)),\left(2 x^{\wedge}(2)-1 ", ",-(1) /(2) \mid t x l e 2\right):\right\} " \quad\right.$ and $" \mathrm{~g}(\mathrm{x})=\mathrm{f}(|\mathrm{x}|)+|\mathrm{f}(\mathrm{x})|$ ' [where $[\mathrm{x}]$ represents the greatest integer function.] The number of points where $g(x)$ is non -differentiable is -
A. 4
B. 5
C. 2
D. 3

## Answer: D

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6. Let $f(x)=\left\{\left\{:([x]]^{",},-2 l e x l e-(1) /(2)\right),\left(2 x^{\wedge}(2)-1 ",-,-(1) /(2)|t x| e 2\right):\right\} " \quad$ and $" \mathrm{~g}(\mathrm{x})=\mathrm{f}(\mathrm{x} \mid)+|\mathrm{f}(\mathrm{x})| `$ [where $[\mathrm{x}]$ represents the greatest integer function.] The number of points where $g(x)$ is discontinuous is -
A. 1
B. 2
C. 3
D. 4

## Answer: B

1. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a continuous function defined defined by $f(x)=\frac{1}{e^{x}+2 e^{-x}}$
Statement $-I: \mathrm{f}(\mathrm{c})=(1) /(3)$ "for some "c inRRStatement $-I I$ Oltf( x$) \mathrm{le}(1) /(2 \operatorname{sqrt}(2))$ " for all "x in RR
A. Statement II is True , Statement -II is True , Statement -II is a correct explanation for statement -
B. Statement $-I$ is True, Statement -II is True, Statement -II is not a correct explanation for Statement -I
C. Statement II is True , Statement II is false .
D. Statement - I is false , Statement -II is True .

## Answer: A

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2. Let $g(x)=\frac{e^{\frac{1}{x}-1}}{e^{\frac{1}{x}+1}}$ for $x \neq 0$ and $g(0)=0$

Statement - I : The functions $f \quad(x \quad)=" x g "(x), x$ in RR $i s \neg$ derivab $\leq a t x=0$ Statement $-I$ Iunderset $(\operatorname{xrarrO})\left(\lim " g(x)^{\wedge}\right.$ does not exist .
A. Statement $-I$ is True, Statement -II is True, Statement -II is a correct explanation for statement -ו
B. Statement ו- is True, Statement -II is True, Statement -II is not a correct explanation for Statement -I
C. Statement -I is True, Statement -II is false .
D. Statement - I is false, Statement -II is True .

## Answer: A

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