



**Class – XII**  
**Mathematics Assignment – 1**

**Topic : Continuity and differentiability**

**Sub Topic : Continuity**

**Total Marks : 20**

**1 Marks :**

- If  $f(x) = |x|$  then  $f(x)$  is  
a) Continuous at  $x=0$  (b) discontinuous at  $x=0$  (c) continuous at all points (d) discontinuous at all points.
- Which one is discontinuous function at any point?  
a)  $\sin x$     b)  $\cos x$     c)  $\frac{1}{1-2x}$     d)  $\frac{1}{1+x^2}$
- If  $f(x)$  is continuous function and  $g(x)$  is discontinuous function, then  $f(x) + g(x)$  is a continuous function. (True/False)
- $f(x) = [x]$  whether  $f(x)$  is a continuous function at integral values. (True/False)

**4 Marks :**

- Find the relationship between  $a$  and  $b$  such that the function defined by  $f(x) = \begin{cases} ax + 1 & x \leq 3 \\ bx + 3 & x > 3 \end{cases}$  is continuous at  $x = 3$
- Discuss the continuity of  $f(x) = \begin{cases} \frac{x}{|x|} & \text{if } x < 0 \\ -1 & \text{if } x \geq 0 \end{cases}$
- Discuss the continuity of  $f(x) = \frac{x^3 - a^3}{x - a}$  is continuous at  $x = a$  then find the value of  $f(a)$ .
- if  $f(x) = \begin{cases} -x^2, & x \leq 0 \\ 5x - 4, & 0 < x \leq 1 \\ 4x^2 - 3x, & 1 < x < 2 \\ 3x + 4, & x \geq 2 \end{cases}$  discuss the continuity of  $f(x)$  at  $x = 0, 1, 2$

**Answers :**

- (1) c (2) c (3) false (4) False (5)  $b + \frac{2}{3} = a$  (6) continuous (7)  $3a^2$   
(8) continuous at  $x = 1, 2$

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**Class – XII**  
**Mathematics Assignment – 2**

**Topic : Continuity and  
Differentiability**

**Sub Topic: Derivative of Composite  
Functions**

**Total Marks : 20**

**1 Marks :**

1. If  $y = \sin x^2$  then  $\frac{dy}{dx}$  is  
a)  $\cos x^2$  b)  $2 \sin x^2$  c)  $2x \cos x^2$  d) None of these
2. If  $y = \tan (3x + 5)$  then  $\frac{dy}{dx}$  is  
a)  $\sec^2 (3x+5)$  b)  $3 \sec^2 (3x+5)$  c)  $\tan 3x$  d) None of these

**True/False :**

- 3). If  $y = \tan 2x$  then  $\frac{dy}{dx} = 2\sec^2 2x$
- 4). If  $y = t^3$ ,  $x = t^2$  then  $\frac{dy}{dx} = \frac{3}{t}$

**4 Marks :**

- 5). If  $y = \sqrt{x^2 + a^2}$  prove that  $y \frac{dy}{dx} - x = 0$
- 6). Differentiate  $y = \frac{\sin(ax+b)}{\cos(cx+d)}$
- 7). If  $f(x) = \cos x^3$ .  $\sin^2(x^5)$  Find  $f'(x)$
- 8). Using chain rule, differentiate  $y = \cos\left(\frac{1+\tan x}{1-\tan x}\right)$

**Answers :**

- (1)  $2x \cos x^2$  (2)  $3\sec^2 (3x + 5)$  (3) True (4) False
- (6)  $a \cos (ax+b) \sec (cx+d) + c \sin (ax+b) \tan (cx+d) \sec (cx+d)$
- (7)  $10x^4 \sin x^5 \cos x^3 - 3x^2 \sin(x^3) \sin^2(x^5)$
- (8)  $-\sec^2\left(\frac{\pi}{4} + x\right) \sin\left(\tan\left(\frac{\pi}{4} + x\right)\right)$

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**Class – XII**  
**Mathematics Assignment – 3**

**Topic :** Continuity and Differentiability  
**Sub Topic:** Implicit Function and Inverse Trigonometric Functions

**1 Marks :**

**Total Marks : 20**

1. If  $x + y = c$  then  $\frac{dy}{dx}$  is  
a) 1      b) -1      c) 0      d) None of these
2. If  $x = \sin y$  then  $\frac{dy}{dx}$  is  
a)  $\frac{1}{\cos y}$       b)  $\frac{1}{\cos x}$       c)  $\cos y$       d)  $\sin y$
- 3).  $\frac{d}{dx} \tan^{-1} x = \text{-----}$
4. If  $y = \sin^{-1} 2x$  then  $\frac{dy}{dx} = \frac{1}{\sqrt{1-4x^2}}$  True/False

**4 Marks :**

- 5). Find  $\frac{dy}{dx}$ ,  $xy + y^2 = \tan x + y$
- 6). If  $y = \sin^{-1} \frac{1-x^2}{1+x^2}$ ,  $0 < x < 1$  find  $\frac{dy}{dx}$
- 7). Find derivative of  $x^6$  w.r.t.  $x^3$
- 8). Differentiate  $\tan^{-1} \frac{2x}{1-x^2}$

**Answers :**

- (1) -1      (2)  $\frac{1}{\cos y}$       (3)  $\frac{1}{1+x^2}$       (4) False      (5)  $\frac{\sec^2 x - y}{x + 2y - 1}$       (6)  $\frac{-2}{1+x^2}$   
 7)  $2x^3$       (8)  $\frac{2}{1+x^2}$

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**Class – XII**  
**Mathematics Assignment – 4**

**Topic : Continuity and Differentiability**

**Sub Topic : Exponential and Logarithmic Function**

**Total Marks : 20**

**1 Marks :**

1.  $\frac{d}{dx} (e^x) = \text{-----}$
2.  $\frac{d}{dx} (\log x) = \text{-----}$
3.  $\frac{d}{dx} (e^{x^3}) = \text{-----}$
4.  $\frac{d}{dx} \log(\cos x) = \text{-----}$

**4 Marks :**

- 5). Differentiate  $\sin(\tan^{-1}(e^{-x}))$
- 6).  $y = e^x + e^{x^2} + e^{x^3} + e^{x^4} + e^{x^5}$  find  $\frac{dy}{dx}$
- 7). Differentiate  $\log(\log x)$ ,  $x > 1$
- 8). If  $y = e^{\sqrt{\cos x}}$  find  $\frac{dy}{dx}$

**Answers :**

- (1)  $e^x$       (2)  $\frac{1}{x}$       (3)  $3x^2 e^{x^3}$       (4)  $-\tan x$       (5)  $\frac{e^{-x} \cos(\tan^{-1} e^{-x})}{1 + e^{-2x}}$
- (6)  $e^x + 2xe^{x^2} + 3x^2e^{x^3} + 4x^3e^{x^4} + 5x^4e^{x^5}$       (7)  $\frac{1}{x \log x}$
- (8)  $\frac{-\sin x}{2\sqrt{\cos x}} e^{\sqrt{\cos x}}$

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**Class – XII**  
**Mathematics Assignment – 5**

**Topic : Continuity and Differentiability**

**Sub Topic : Logarithmic Differentiation**

**Total Marks : 20**

**1 Marks :**

- 1). if  $y = e^{\log x}$  then  $\frac{dy}{dx}$  is  
a)  $\log x - x$    b)  $x e^{\log x}$    c) 1   d)  $e^{\log x} \log x$
- 2). if  $y = x^a$   $a \in \mathbb{R}$  then  $\frac{dy}{dx}$  is  
a)  $x^a \log x$    b)  $x^a \log a$    c)  $a^x \log a$    d)  $a x^{a-1}$

**True/False**

- 3). If  $y = x^x$  then  $\frac{dy}{dx} = x^x (1 + \log x)$
- 4). Logarithmic differentiation is essential for the function of when  
 $f(x) = (p(x))^{q(x)}$

**4 Marks:**

- 5). Differentiate  $y = x^{\sin x} + (\sin x)^x$  w.r.t.  $x$
- 6). If  $y = \sqrt{x + \sqrt{x + \sqrt{x + \dots}}}$  then prove that  $(2y-1) \ln \frac{dy}{dx}$
- 7). If  $x^p y^q = (x + y)^{p+q}$  then show that  $\frac{dy}{dx} = \frac{y}{x}$
- 8). Find  $\frac{dy}{dx}$  if  $x^y + y^x = 1$

**Answers :**

- (1) c   (2) d   (3) True   (4) True
- (5)  $x^{\sin x} \left( \frac{\sin x}{x} + \cos x \cdot \log x \right) + (\sin x)^x (x \cot x + \log(\sin x))$
- (6)  $- \left[ \frac{y x^{y-1} + y^x \log y}{x^y \log x + x y^{x-1}} \right]$

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**Class – XII**  
**Mathematics Assignment – 6**

**Topic :** Continuity and Differentiability

**Sub Topic :** Parametric Form

**Total Marks : 20**

**1 Marks :**

1. If  $x=4at$ ,  $y = at^4$  then  $\frac{dy}{dx}$  is  
a) 4   b)  $4a$    c)  $4at$    d)  $t^3$
2. If  $x = a \cos \theta$ ,  $y = b \cos \theta$  then  $\frac{dy}{dx}$   
a)  $\frac{a}{b}$    b)  $\frac{\sin \theta}{\cos \theta}$    c)  $\frac{b}{a}$    d) 1

**True/False**

- 3). If  $x = \log t^2$ , then  $y = \log t^3$  then  $\frac{dy}{dx} = \frac{3}{2t}$
- 4). If  $x = \log (\sin x)$ ,  $y = \log (\cos x)$  then  $\frac{dy}{dx} = -\tan^2 x$

**4 Marks :**

5. Find  $\frac{dy}{dx}$  if  $x^{2/3} + y^{2/3} = a^{2/3}$
- 6). Find  $\frac{dy}{dx}$  if  $x = a (\theta - \sin \theta)$ ,  $y = b (1 + \cos \theta)$
- 7). If  $x = a \cos^3 \theta$ ,  $y = a \sin^3 \theta$  find  $\frac{dy}{dx}$
- 8). If  $x = \frac{1-t^2}{1+t^2}$ ,  $y = \frac{2t}{1+t^2}$  then prove that  $\frac{dy}{dx} + \frac{x}{y} = 0$

**Answers :**

- (1) d   (2) c   (3) False   (4) True   (5)  $-\sqrt[3]{\frac{y}{x}}$    (6)  $-\cot \theta/2$   
(7)  $-\tan \theta$

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**Class – XII**  
**Mathematics Assignment – 7**  
**Topic : Continuity and Differentiability**

**Sub Topic : Second Order Derivative**

**Total Marks : 20**

**1 Marks :**

1.  $y = e^x$  then  $y'' = \text{-----}$
2.  $y = 6x$  then  $\frac{d^2y}{dx^2} = \text{-----}$
3.  $y = \log x$  then  $y_2 = \text{-----}$
4. If  $y = x^{10}$  then  $\frac{d^2y}{dx^2} = 9x^8$  True/False

**4 Marks :**

- 5). Find second order derivative of  $y = x^3 \log x$
- 6). If  $e^y (x + 1) = 1$  Prove that  $\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^2$
- 7). If  $y = A \cos nx + B \sin nx$  show that  $\frac{d^2y}{dx^2} + n^2y = 0$
- 8). If  $y = \sin^{-1} x$  then prove that  $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} = 0$

**Answers :**

- (1)  $e^x$     (2) 0    (3)  $-\frac{1}{x^2}$     (4) False    (5)  $x(5 + 6 \log x)$

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**Class – XII**  
**Mathematics Assignment – 8**  
**Topic : Continuity and**  
**Differentiability**  
**Sub Topic : Mean Value Theorem**  
**Total Marks : 20**

**1 Marks :**

1. The value of  $c$  in Rolle's Theorem for function  $f(x) = x^3 - 3x$  in  $[0, \sqrt{3}]$  is  
a) 1                      b) -1                      c)  $\frac{3}{2}$                       d)  $\frac{1}{3}$
2. For the function  $f(x) = x + \frac{1}{x}$ ,  $x \in [1, 3]$  the value of  $c$  for mean value theorem is  
a) 1                      b)  $\sqrt{3}$                       c) 2                      d) None of these
3. If a function is continuous whether it is differentiable.  
**Yes/No**
- 3). Define Rolle' Theorem

**4 Marks :**

- 5). Verify Rolle's Theorem for  $f(x) = (x + 1)(x - 4)$  on  $[-1, 4]$
- 6). Verify Rolle's Theorem for  $f(x) = \sin x + \cos x$  on  $[0, 2\pi]$
- 7). Verify L.M.V. for  $f(x) = x^3 - 5x^2 - 3x$  in  $[1, 3]$
- 8). Verify L.M.V. for  $f(x) = x(x - 1)(x - 2)$   $\left[0, \frac{1}{2}\right]$

**Answers :**

(1) a    (2) b    (3) Yes

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