1. If $f(x) = \begin{cases} x & x \in Q \\ -x & x \notin Q \end{cases}$, then f is continuous at- **[AIEEE 2002]**

(1) Only at zero (2) only at 0, 1
(3) all real numbers (4) all rational numbers

2. If $y = \left(x+\sqrt{1+x^2}\right)^n$ then $(1 + x^2)y_2 + xy_1 =$ **[AIEEE-2002]**

(1) ny^2 (2) n^2y
(3) n^2y^2 (4) None of these

3. If for all values of x & y; f(x + y) = f(x).f(y) and f(5) = 2, f'(0) = 3, then f'(5) is- **[AIEEE-2002]**

(1) 3 (2) 4 (3) 5 (4) 6

4. If $f(x) = \begin{cases} xe^{-\left(\frac{1}{|x|}+\frac{1}{x}\right)}, & x \neq 0 \\ 0 & , x=0 \end{cases}$ then f(x) is- **[AIEEE 2003]**

(1) discontinuous everywhere
(2) continuous as well as differentiable for all x
(3) continuous for all x but not differentiable at x=0
(4) neither differentiable nor continuous at x = 0

5. Let $f(x) = \frac{1-\tan x}{4x-\pi}$, $x \neq \frac{\pi}{4}$, $x \in \left[0, \frac{\pi}{2}\right]$, If f(x) is continuous in $\left[0, \frac{\pi}{2}\right]$, then $f\left(\frac{\pi}{4}\right)$ is- **[AIEEE 2004]**

(1) 1 (2) 1/2
(3) –1/2 (4) –1

6. The set of points where $f(x) = \frac{x}{1+|x|}$ is differentiable **[AIEEE-2006]**

(1) $(-\infty, -1) \cup (-1, \infty)$ (2) $(-\infty, \infty)$
(3) $(0, \infty)$ (4) $(-\infty, 0) \cup (0, \infty)$

7. If $x^m.y^n = (x + y)^{m+n}$, then $\frac{dy}{dx}$ is **[AIEEE-2006]**

(1) $\frac{x+y}{xy}$ (2) xy (3) $\frac{x}{y}$ (4) $\frac{y}{x}$

8. The function $f : R/\{0\} \to R$ given by $f(x) = \frac{1}{x} - \frac{2}{e^{2x}-1}$ can be made continuous at x = 0 by defining f(0) as- **[AIEEE 2007]**

(1) 2 (2) –1 (3) 0 (4) 1

9. Let y be an implicit function of x defined by $x^{2x} - 2x^x \cot y - 1 = 0$. Then y'(1) equals **[AIEEE-2009]**

(1) log 2 (2) – log 2
(3) – 1 (4) 1

10. Let $f : (-1, 1) \to R$ be a differentiablefunction with f(0) = – 1 and f'(0) = 1. Let $g(x) = [f(2f(x) + 2)]^2$. Then g'(0) **[AIEEE-2010]**

(1) 4 (2) –4
(3) 0 (4) –2

11. If function f(x) is differentiable at x = a then $\lim_{x \to a} \frac{x^2 f(a) - a^2 f(x)}{x-a}$ **[AIEEE-2011]**

(1) $2a\ f(a) + a^2\ f'(a)$ (2) $-a^2\ f'(a)$
(3) $af(a) - a^2\ f'(a)$ (4) $2af(a) - a^2\ f'(a)$

12. $\frac{d^2x}{dy^2}$ equal to **[AIEEE–2011]**

(1) $\left(\frac{d^2y}{dx^2}\right)^{-1}$ (2) $-\left(\frac{d^2y}{dx^2}\right)^{-1}\left(\frac{dy}{dx}\right)^{-3}$

(3) $\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-2}$ (4) $-\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-3}$

13. The values of p and q for which the function

$$f(x) = \begin{cases} \frac{\sin(p+1)x + \sin x}{x} & , \quad x<0 \\ q & , \quad x=0 \\ \frac{\sqrt{x+x^2}-\sqrt{x}}{x^{\frac{3}{2}}} & , \quad x>0 \end{cases}$$

is continuous for all x in R, are :- **[AIEEE 2011]**

(1) $p = -\frac{3}{2}, q = \frac{1}{2}$ (2) $p = \frac{1}{2}, q = \frac{3}{2}$

(3) $p = \frac{1}{2}, q = -\frac{3}{2}$ (4) $p = \frac{5}{2}, q = \frac{1}{2}$

14. The fucntion $f(x) = [x]\cos\left(\frac{(2x-1)\pi}{2}\right)$, [ ] denotes the greatest integer function, is discontinuous at- **[AIEEE-2012]**

(1) all x
(2) all integer points
(3) no x
(4) x which is not an integer

15. If $f(x) = a\,|\sin x| + be^{|x|} + c|x|^3$, where a, b, c $\in$ R, is differentiable at x = 0,then **[AIEEE-2012 (Online)]**

(1) c = 0, a = 0, b is any real number
(2) a = 0, b and c are any real numbers
(3) b = 0, c = 0, a is any real number
(4) a = 0, b = 0, c is any real number

16. If x + |y| = 2y then y as a function of x, at x = 0 is **[AIEEE-2012 (Online)]**

(1) Neither continuous nor differentiable
(2) Continuous as well as differentiable
(3) Differentiable but not continuous
(4) Continuous but not differentiable

17. If $f'(x) = \sin(\log x)$ and $y = f\left(\frac{2x+3}{3-2x}\right)$, then $\frac{dy}{dx}$ equals **[AIEEE-2012 (Online)]**

(1) $\frac{12}{(3-2x)^2}\cos\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$

(2) $\sin\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$

(3) $\frac{12}{(3-2x)^2}\sin\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$

(4) $\frac{12}{(3-2x)^2}$

18. If $y = \sec(\tan^{-1}x)$, then $\frac{dy}{dx}$ at x = 1 is equal to **[JEE (Main)-2013]**

(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}$
(3) 1 (4) $\sqrt{2}$

19. If the function.

$$g(x) = \begin{cases} k\sqrt{x+1}, & 0 \le x \le 3 \\ mx+2, & 3 < x \le 5 \end{cases}$$

is differentiable, then value of k + m is **[JEE (Main)-2015]**

(1) $\frac{10}{3}$ (2) 4
(3) 2 (4) $\frac{16}{5}$

20. For $x \in R$, $f(x) = |\log 2 - \sin x|$ and $g(x) = f(f(x))$, then : **[JEE (Main)-2016]**

(1) g is differentiable at x = 0 and $g'(0) = -\sin(\log 2)$
(2) g is not differentiable at x = 0
(3) $g'(0) = \cos(\log 2)$
(4) $g'(0) = -\cos(\log 2)$

21. If for $x \in \left(0, \frac{1}{4}\right)$, the derivative of $\tan^{-1}\left(\frac{6x\sqrt{x}}{1-9x^3}\right)$ is $\sqrt{x}\cdot g(x)$, then g(x) equals :- **[JEE (Main)-2017]**

(1) $\frac{3}{1+9x^3}$ (2) $\frac{9}{1+9x^3}$ (3) $\frac{3x\sqrt{x}}{1-9x^3}$ (4) $\frac{3x}{1-9x^3}$

22. Let f : R $\to$ R is a function which is defined by f(x) = max $\{x, x^3\}$ set of points on which f(x) is not differentiable is- **[IIT-2001]**

(1) {–1, 1} (2) {–1, 0}
(3) {0, 1} (4) {–1, 0, 1}

23. Which of the following function is differentiable at x = 0 ? **[IIT-2001]**

(1) cos(|x|) + |x| (2) cos(|x|) – |x|
(3) sin(|x|) + |x| (4) sin(|x|) – |x|

24. Let y be a function of x, such that log(x + y) – 2xy = 0, then y'(0) is- **[IIT-2004]**

(1) 0 (2) 1
(3) 1/2 (4) 3/2

25. If x cosy + y cosx = π, then y''(0) = **[IIT-2005]**

(1) π (2) $-\pi$
(3) 0 (4) 1

26. If f''(x) = –f(x) and g(x) = f'(x)

and $F(x) = \left(f\left(\frac{x}{2}\right)\right)^2 + \left(g\left(\frac{x}{2}\right)\right)^2$

and given that F(5) = 5, then F(10) is- **[IIT-2006]**

(1) 15 (2) 0
(3) 5 (4) 10

***27.** Let f : R $\to$ R be a function such that $f(x + y) = f(x) + f(y)$, $\forall$ x, y $\in$ R. If $f(x)$ is differentiable at x = 0, then **[IIT-2011]**

(1) $f(x)$ is differentiable only in a finite interval containing zero
(2) $f(x)$ is continuous $\forall$ x $\in$ R
(3) $f'(x)$ is constant $\forall$ x $\in$ R
(4) $f(x)$ is differentiable except at finitely many points

*28. If $f(x)=\begin{cases} -x-\frac{\pi}{2} & , \quad x\le -\frac{\pi}{2} \\ -\cos x & , \quad -\frac{\pi}{2}<x\le 0 \\ x-1 & , \quad 0<x\le 1 \\ \ell nx & , \quad x>1 \end{cases}$ then

[IIT-2011]

(1) $f(x)$ is continuous at $x=-\frac{\pi}{2}$

(2) $f(x)$ is not differentiable at $x = 0$

(3) $f(x)$ is differentiable at $x = 1$

(4) $f(x)$ is differentiable at $x=-\frac{3}{2}$

29. Let $f : R \to R$ and $g : R \to R$ be respectively given by $f(x) = |x| + 1$ and $g(x) = x^2 + 1$. Define $h : R \to R$ by

$$h(x)=\begin{cases} \max\{f(x),g(x)\} & \text{if} \quad x\le 0, \\ \min\{f(x),g(x)\} & \text{if} \quad x>0. \end{cases}$$

The number of points at which h(x) is not differentiable is **[JEE (Advanced)-2014]**

(1) 1 (2) 2

(3) 3 (4) 0

30. Let $y(x) = \cos(3\cos^{-1}x)$, $x \in [-1, 1]$, $x \neq \pm\frac{\sqrt{3}}{2}$.

Then $\frac{1}{y(x)}\left\{(x^2-1)\frac{d^2y(x)}{dx^2}+x\frac{dy(x)}{dx}\right\}$ equals

[JEE (Advanced)-2014]

(1) 1 (2) 2

(3) 8 (4) 9

* **Marked Questions are multiple answer**

PREVIOUS YEARS QUESTIONS			ANSWER KEY						Exercise-II
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**1**	**2**	**4**	**3**	**3**	**2**	**4**	**4**	**3**	**2**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**4**	**4**	**1**	**3**	**4**	**4**	**3**	**1**	**3**	**3**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**2**	**4**	**4**	**2**	**1**	**3**	**2,3**	**1,2,3,4**	**3**	**4**