11B(36-37)

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36) For $x \in \mathbb{R}$, $f(x) = \left|\log 2 - \sin(x)\right|$ and $g(x) = f(f(x))$, then (JEE M 2016)
   (a) $g'(0) = -\cos(\log 2)$
   (b) g is differentiable at $x = 0$ and $g'(0) = -\sin(\log 2)$
   (c) g is not differentiable at $x = 0$
   (d) $g'(0) = \cos(\log 2)$

37) $\lim_{x\to\infty}\left(\frac{(n+1)(n+2)...3n}{n^{2n}}\right)^{\frac{1}{n}}$ is equal to: (JEE M 2016)
   (a) $\frac{9}{e^2}$
   (b) $3\log 3 - 2$
   (c) $\frac{18}{e^4}$
   (d) $\frac{27}{e^2}$

38) Let p = $\lim_{x\to 0^+}\left(1+\tan^2(\sqrt{x})\right)^{\frac{1}{2x}}$ then $\log p$ is equal to: (JEE M 2016)
   (a) $\frac{1}{2}$
   (b) $\frac{1}{4}$
   (c) 2
   (d) 1

39) $\lim_{x\to\frac{\pi}{2}}\frac{\cot(x)-\cos(x)}{(\pi-2x)^3}$ equals (JEE M 2017)
   (a) $\frac{1}{4}$ (b) $\frac{1}{24}$ (c) $\frac{1}{16}$ (d) $\frac{1}{8}$

40) For each $t \in \mathbb{R}$, let $[t]$ be the greatest integer less than or equal to t. Then $\lim_{x\to 0^+} x\left(\left[\frac{1}{x}\right] + \left[\frac{2}{x}\right] + ... + \left[\frac{15}{x}\right]\right)$ (JEE M 2018)
   (a) is equal to 15
   (b) is equal to 120
   (c) does not exist($in\mathbb{R}$)
   (d) is equal to 0

41) For S = $t \in \mathbb{R} : f(x) = |x-\pi|\,(e^{|x|}-1)\sin(|x|)$ is not differentiable at t. Then the set S is equal to: (JEE M 2018)
   (a) 0
   (b) π
   (c) $0, \pi$
   (d) $\emptyset$(an empty set)

42) $\lim_{y\to 0}\frac{\sqrt{1+\sqrt{1+y^4}}-\sqrt{2}}{y^4}$ (JEE M 2019- 9 Jan(M))
   (a) exists and equals $\frac{1}{4\sqrt{2}}$
   (b) exists and equals $\frac{1}{2\sqrt{2}(\sqrt{2}+1)}$
   (c) exists and equals $\frac{1}{2\sqrt{2}}$
   (d) does not exist

43) Let $f : \mathbb{R} \to \mathbb{R}$ is a function defined as (JEE M 2019- 9 Jan(M))

$$f(x) = \begin{cases} 5, & if\, x \le 1 \\ a + bx, & if\, 1 < 3 \\ b + 5x, & if\, 3 \le x < 5 \\ 30, & if\, x \ge 5 \end{cases} \quad (1)$$

   (a) continuous if $a = 5$ and $b = 5$
   (b) continuous if $a = -5$ and $b = 10$
   (c) continuous if $a = 0$ and $b = 5$
   (d) not continuous for any values of a and b

44) If the function f defined on $\left(\frac{\pi}{3}, \frac{\pi}{6}\right)$ by

$$f(x) = \begin{cases} \frac{\sqrt{2}cos(x)-1}{cot(x)-1}, & x \ne \frac{\pi}{4} \\ k, & x = \frac{\pi}{4} \end{cases} \quad (2)$$

(JEE M 2019- 9 April(M))

   (a) 2 (b) $\frac{1}{2}$ (c) 1 (d) $\frac{1}{\sqrt{2}}$

45) Let $f(x) = 15 - |x-10|, x \to \mathbb{R}$. Then the set of all values of x, at which the function, g(x)=f(f(x)) is not differentiable, is: (JEE M 2019- 9 April(M))
   (a) $\{5, 10, 15\}$
   (b) $\{10, 15\}$
   (c) $\{5, 10, 15, 20\}$
   (d) $\{10\}$