Differentiability - Class XII

Past Year JEE Questions

Questions

Quetion: 01

Let a, b ∈ R, b ∈ 0, Define a function

$$f(x) = \begin{cases} a\sin\frac{\pi}{2}(x-1), & for\, x \le 0 \\ \frac{\tan 2x - \sin 2x}{bx^3}, & for\, x > 0 \end{cases}.$$

If f is continuous at x = 0, then 10 − ab is equal to _____.

Solutions

Solution: 01

Answer

Correct Answer is **14**

Explanation

$$f(x) = \begin{cases} a\sin\frac{\pi}{2}(x-1), & for\, x \le 0 \\ \frac{\tan 2x - \sin 2x}{bx^3}, & for\, x > 0 \end{cases}$$

For continuity at '0'

$$\lim_{x\to 0^+} f(x) = f(0)$$

$$\Rightarrow \lim_{x\to 0^+} \frac{\tan 2x - \sin 2x}{bx^3} = -a$$

$$\Rightarrow \lim_{x\to 0^+} \frac{\frac{8x^3}{3} + \frac{8x^3}{3!}}{bx^3} = -a$$

$$\Rightarrow 8\left(\frac{1}{3} + \frac{1}{3!}\right) = -ab$$

$$\Rightarrow 4 = -ab$$

$$\Rightarrow 10 - ab = 14$$