| | |
|---|---|
| Let $p=\lim_{x\to 0+}\left(1+\tan^2\sqrt{x}\right)^{\frac{1}{2x}}$ then log p is equal to:<br><br>(1) 2<br>(2) 1<br>(3) $\frac{1}{2}$<br>(4) $\frac{1}{4}$<br><br>Based on JEE Main 2016<br>123IITJEE.COM | $p=\lim_{x\to 0+}\left(1+\tan^2\sqrt{x}\right)^{\frac{1}{2x}}$<br>$\therefore p=\lim_{x\to 0+}\left(\sec^2\sqrt{x}\right)^{\frac{1}{2x}}$<br>$\therefore p=\lim_{x\to 0+}\left(\sec\sqrt{x}\right)^{\frac{1}{x}}$<br>$\therefore \ln p=\ln\left\{\lim_{x\to 0+}\left(\sec\sqrt{x}\right)^{\frac{1}{x}}\right\}$<br>$\therefore \ln p=\lim_{x\to 0+}\ln\left(\sec\sqrt{x}\right)^{\frac{1}{x}}=\lim_{x\to 0+}\frac{1}{x}\ln\left(\sec\sqrt{x}\right)$<br>Using L.H. Rule as the above limit has $\frac{0}{0}$ form,<br>$\therefore \ln p=\lim_{x\to 0+}\frac{1}{1}\frac{1}{\sec\sqrt{x}}\sec\sqrt{x}\tan\sqrt{x}\frac{1}{2\sqrt{x}}$<br>$\therefore \ln p=\lim_{x\to 0+}\frac{1}{2}\frac{\tan\sqrt{x}}{\sqrt{x}}=\frac{1}{2}$<br>Hence, Option (3). |