

$$\lim_{n \rightarrow \infty} \frac{1 - \cos^n x}{\sin^n x} \Rightarrow \frac{(1 - \cos x)(1 + \cos x) \dots (1 + \cos^{n-1} x)}{(1 - \cos^n x)} \Rightarrow \frac{1}{1 - \cos x}$$

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$$\lim_{n \rightarrow \frac{\pi}{2}} \frac{1 - \tan^n x}{\sin^n x - \cos^n x} = \frac{\cos^n x - \sin^n x}{\sin^n x - \cos^n x} = \frac{-1}{\frac{1}{\sqrt{2}}} = -\sqrt{2}$$

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$$\lim_{n \rightarrow \frac{\pi}{2}} \frac{\tan^n x - 1}{\cos^n x} = \frac{\sin^n x - \cos^n x}{\cos^n x} = \frac{-1}{\cos^n x} = -1$$

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