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$$\lim_{x \rightarrow 1^-} (1-x^2)^{\frac{\pi}{4} - \operatorname{arctg} x} =$$

$$= \lim_{x \rightarrow 1^-} e^{(\frac{\pi}{4} - \operatorname{arctg} x) \log(1-x^2)}$$

$$= \lim_{x \rightarrow 1^-} e^{(\frac{\pi}{4} - \operatorname{arctg} x) \frac{1}{1-x^2} \cdot (1-x^2) \log(1-x^2)}$$

$$\lim_{x \rightarrow 1^-} (1-x^2) \log(1-x^2) =$$

$$= \lim_{y \rightarrow 0} y \log y = 0$$

$$\lim_{x \rightarrow 1^-} \frac{(\frac{\pi}{4} - \operatorname{arctg} x)}{1-x^2}$$

$$y = \frac{\pi}{4} - \operatorname{arctg} x$$

$$\operatorname{arctg} x =$$

$$x = \operatorname{tg}$$

$$\lim_{y \rightarrow 0} \frac{1}{1-y^2}$$

$$= \lim_{y \rightarrow 0} \frac{1}{1-y^2}$$

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$$= \frac{1}{4}$$

Luphu 1991

$$\arctan x = \frac{\pi}{4} - y$$

$$x = \tan\left(\frac{\pi}{4} - y\right) = \frac{\tan\frac{\pi}{4} - \tan y}{1 + \tan\frac{\pi}{4}\tan y} = \frac{1 - \tan y}{1 + \tan y}$$

$-x^2 \log(1-x^2)$

$$\lim_{y \rightarrow 0} \frac{y}{1 - \frac{(1 - \tan y)^2}{(1 + \tan y)^2}} = \lim_{y \rightarrow 0} \frac{y (1 + \tan y)^2}{(1 + \tan y)^2 - (1 - \tan y)^2} =$$

$$= \lim_{y \rightarrow 0} \frac{y (1 + \tan y)^2}{1 + 2\tan y + \tan^2 y - 1 + 2\tan y - \tan^2 y} =$$

$$= \lim_{y \rightarrow 0} \frac{y (1 + \tan y)^2}{4 \tan y} =$$

$$= \frac{1}{4} \cdot 1 = \frac{1}{4}$$