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$$\lim_{x\to+\infty}\left(\cos\left(\operatorname{arctg}\frac{1}{x}\right)\right)^{x} =$$

$$= \lim_{x\to+\infty} e^{x \log\cos\left(\operatorname{arctg}\frac{1}{x}\right)} =$$

$$= \lim_{x\to+\infty} e^{x \log\left[1+\left(\cos\left(\operatorname{arctg}\frac{1}{x}\right)-1\right)\right]}$$

$$= \lim_{x\to+\infty} e^{x\left[\cos\left(\operatorname{arctg}\frac{1}{x}\right)-1\right]\frac{\log\left[1+\left(\cos\operatorname{arctg}\frac{1}{x}-1\right)\right]}{\cos\operatorname{arctg}\frac{1}{x}-1}} =$$

$$= \lim_{x\to+\infty} e^{-x\,\frac{1-\cos\left(\operatorname{arctg}\frac{1}{x}\right)}{\operatorname{arctg}\frac{1}{x}}\cdot\operatorname{arctg}\frac{1}{x}\,\frac{\log\left[1+\left(\cos\operatorname{arctg}\frac{1}{x}-1\right)\right]}{\cos\operatorname{arctg}\frac{1}{x}-1}}$$

$$= e^{-1\cdot 0\cdot 1} = 1$$

$\ldots \operatorname{cotg} x^2 \Big)$

$\ldots \Big| - 1 \Big)$

$\ldots \frac{\log \sin x}{\operatorname{cotg} x^2}\Big| - 1\Big)$

$\ldots \frac{\log \sin x}{\cos x^2}\Big| - 1\Big)$

∞