*Производная арктангенса:*

$$\frac{d}{dx}(arctg x) = \frac{1}{1+x^{2}} $$

*Производная котангенса:*

$$\frac{d}{dx}(ctg x) = -\frac{1}{sin^{2}x}$$

*Производная тангенса:*

$$\frac{d}{dx}(tg x) = \frac{1}{cos^{2}x}$$

1. **Способ решения**

$$\frac{d}{dx}\left(\frac{\sqrt{2} arctg \left(\sqrt{2} ctg x\right)}{2}\right)=\frac{\sqrt{2}}{2}∙\frac{d}{dx}\left(arctg \left(\sqrt{2} ctg x\right)\right)=$$

$$=\frac{\sqrt{2}}{2}∙\frac{d}{dx}(\sqrt{2} ctg x) ∙\left(\frac{1}{1+(\sqrt{2} ctg x)^{2}}\right)= $$

$$=\frac{\sqrt{2}∙\sqrt{2}}{2}∙\frac{d}{dx}(ctg x) ∙\left(\frac{1}{1+2 ctg^{2}x}\right)=-\frac{1}{sin^{2}x}∙\frac{1}{1+2 ctg^{2}x}$$

$$=-\frac{1}{sin^{2}x+2\frac{sin^{2}x∙cos^{2}x}{sin^{2}x} }=-\frac{1}{sin^{2}x+2cos^{2}x }=$$

$$-\frac{1}{sin^{2}x+cos^{2}x+sin^{2}x }=-\frac{1}{sin^{2}x+cos^{2}x+cos^{2}x }=$$

$$=-\frac{1}{1+cos^{2}x }=-\frac{1}{1+1- sin^{2}x }=-\frac{1}{2- sin^{2}x }=$$

$$=\frac{1}{sin^{2}x-2 };$$

**2)Способ решения**

$$\frac{d}{dx}\left(-\frac{ arctg \left(\frac{tg x}{\sqrt{2}}\right)}{\sqrt{2}}\right)=-\frac{1}{\sqrt{2}}\frac{d}{dx}\left(arctg \left(\frac{tg x}{\sqrt{2}}\right)\right)=$$

$$=-\frac{1}{\sqrt{2}}\frac{d}{dx}\left(\frac{tg x}{\sqrt{2}}\right)∙\left(\frac{1}{1 + \left(\frac{tg x}{\sqrt{2}}\right)^{2}}\right)=$$

$$=-\frac{1}{\sqrt{2}∙\sqrt{2}}\frac{d}{dx}\left(tg x\right)∙\left(\frac{1}{1 + \frac{tg^{2}x}{2}}\right)=-\frac{2}{2}\left(\frac{1}{cos^{2}x}\right)\left(\frac{1}{2 + tg^{2}x}\right)=$$

$$=-\left(\frac{1}{2cos^{2}x+ cos^{2}x tg^{2}x}\right)=-\left(\frac{1}{2cos^{2}x+ \frac{sin^{2}x cos^{2}x}{cos^{2}x}}\right)=$$

$$=-\left(\frac{1}{cos^{2}x +cos^{2}x+ sin^{2}x}\right)=-\left(\frac{1}{cos^{2}x+ 1}\right)=$$

$$=-\frac{1}{1+cos^{2}x }=-\frac{1}{1+1- sin^{2}x }=-\frac{1}{2- sin^{2}x }=$$

$$=\frac{1}{sin^{2}x-2 };$$