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$$\lim_{x\to+\infty} \left(3^x + x^2 \operatorname{arctg} x\right)^{\frac{x}{x^2-3}} =$$

$$\frac{x}{x^2+3} \log\left(3^x + x^2 \operatorname{arctg} x\right)$$

$$= \lim_{x\to+\infty} e$$

$$\frac{x}{x^2+3}\left(3^x + x^2 \operatorname{arctg} x\right) \frac{\log\left(3^x + x^2 \operatorname{arctg} x\right)}{3^x + x^2 \operatorname{arctg} x}$$

$$= \lim_{x\to+\infty} e$$

$$\frac{x}{x^2+3} \log\left[3^x\left(1 + \frac{x^2}{3^x}\operatorname{arctg} x\right)\right]$$

$$= \lim_{x\to+\infty} e$$

$$\frac{x}{x^2+3}\log 3^x + \frac{x}{x^2+3}\log\left(1 + \frac{x^2}{3^x}\operatorname{arctg} x\right)$$

$$= \lim_{x\to+\infty} e$$

$$\frac{x}{x^2+3}$$

$$= \lim_{x\to+\infty} e$$

$$x \, e$$

$$= \lim_{x\to+\infty} e$$

$$1 \cdot \log 3$$

$$= e \quad e$$

$$\log_3 e$$

$$= e \quad e$$

$$\frac{1}{\log_3}$$

$$= e$$

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$$\frac{x}{x^2+3}\log_3 3^x \frac{1}{\log 3}$$

$$= \lim_{x\to+\infty} e^{\frac{x}{x^2+3}\frac{x^2}{3^x}\operatorname{arctg}x \log\left(1+\frac{x^2}{3^x}\operatorname{arctg}x\right)\Big/\frac{x^2}{3^x}\operatorname{arctg}x} \cdot e^{\frac{x^2}{x^2+3}\cdot\frac{1}{\log 3}\cdot\frac{x}{3^x}\operatorname{arctg}x \log\left(1+\frac{x^2}{3^x}\operatorname{arctg}x\right)\Big/\frac{x^2}{3^x}\operatorname{arctg}x} =$$

$$= \lim_{x\to+\infty} e^{\frac{1}{1\cdot\log 3}\cdot 1\cdot 0\cdot\frac{\pi}{2}\cdot 0} e^{\log\left(1+\frac{x^2}{3^x}\operatorname{arctg}x\right)\Big/\frac{x^2}{3^x}\operatorname{arctg}x} =$$

$$= e^0 e^{\lim_{y\to 0}\frac{\log(1+y)}{y}} = e^{\frac{1}{\log_3 e}} = e^{\log_3 e}$$