$$\sum x^n \operatorname{tg} \frac{x}{2^n}$$

$$\lim_{n\to\infty} \left| \frac{x^{n+1} \operatorname{tg} \frac{x}{2^{n+1}} \to |0|}{x^n \operatorname{tg} \frac{x}{2^n} \to |0|} \right| = \lim_{n\to\infty} |x| \left| \frac{\frac{\sin\left(\frac{x}{2^{n+1}}\right)}{\cos \frac{x}{2^{n+1}}}}{\frac{\cos \frac{2x}{2^{n+1}}}{\sin \frac{2x}{2^{n+1}}}} \right| =$$

$$\lim_{n\to\infty} |x| \cdot \left| \frac{\sin \frac{x}{2^{n+1}} \cdot \left(\underbrace{\cos^2 \frac{x}{2^{n+1}}}_{=1} - \underbrace{\sin^2 \frac{x}{2^{n+1}}}_{\sin^2 0 = 0} \right)}{2 \sin \frac{x}{2^{n+1}} \cdot \underbrace{\cos^2 \frac{x}{2^{n+1}}}} \right| = \frac{|x|}{2} \cdot \frac{1-0}{1} = \frac{|x|}{2} < 1$$

$\cos 2\ell = \cos^2 x - \sin^2 x$

$\sin 2x = 2 \sin x \cos x$

$\cos^2 0 = 1$

$|x| < 2$

$-2 < x < 2$

$x \in (-2, 2)$

$$\sum_{n=1}^{\infty} (\ln x)^n$$

$q = \ln x$

$|\ln x| < 1$

$-1 < \ln x < 1$ $\qquad x \in \left(\frac{1}{e}, e\right)$

$\ln e = 1$

$\ln e = 1 \quad | \cdot (-1)$

$-\ln e = -1$

$\ln e^{-1} = -1$