Geom. sarja $\sum_{n=1}^{\infty} a_1 q^{n-1}$ suppenee jos

1) $a_1 = 0 \Rightarrow S = 0$

2) $-1 < q < 1 \Rightarrow S = \frac{a_1}{1-q}$

545. $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8}$

$-1 < q = -\frac{1}{2} < 1$ suppenee ja $S = \frac{a_1}{1-q} = \frac{1}{1-(-\frac{1}{2})} = \underline{\underline{\frac{2}{3}}}$

$$S_n = \frac{a_1(1-q^n)}{1-q} = \frac{1\cdot(1-(-\frac{1}{2})^n)}{1-(-\frac{1}{2})} = \underline{\underline{\frac{2}{3} - \frac{2}{3}\left(-\frac{1}{2}\right)^n}}$$

$$|S_n - S| = \left|\cancel{\tfrac{2}{3}} - \frac{2}{3}\left(-\frac{1}{2}\right)^n - \cancel{\tfrac{2}{3}}\right| = \frac{2}{3}\left(\frac{1}{2}\right)^n < 0{,}001 \quad \|:\tfrac{2}{3}$$

$$\left(\frac{1}{2}\right)^n < 0{,}0015 \quad \| \log$$

$$n \cdot \log\left(\tfrac{1}{2}\right) < \log 0{,}0015 \quad \| \log\tfrac{1}{2} < 0$$

$$n > 9{,}4$$

V: 10 termiä

550. Geom. sarja $q = \frac{a_{n+1}}{a_n} = \frac{x^2+3x}{x^2+1}$

1° $-1 < \frac{x^2+3x}{x^2+1} < 1$

2° $a_1 = x^2+1 \neq 0$ ei ratk.

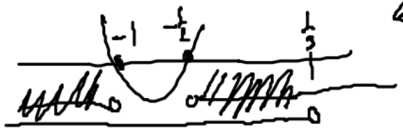
1° $\frac{x^2+3x}{x^2+1} > -1 \quad \Vert \cdot(x^2+1)$ tai $\frac{x^2+3x}{x^2+1} < 1 \quad \Vert \cdot(x^2+1) > 0$

$x^2+3x > -x^2-1$

$2x^2+3x+1 > 0$

nollak. ratk. kaavalla

$x = -\frac{1}{2}$ tai -1



$x^2+3x < x^2+1$

$3x < 1$

$x < \frac{1}{3}$

V: $x < -1$ tai $-\frac{1}{2} < x < \frac{1}{3}$

s. 98: 540, 541, 544, 547, 549

555. $\sum_{k=0}^{\infty}\left(\frac{2x-1}{3x+1}\right)^k$

0^0 ei määr. $\rightarrow \frac{2x-1}{3x+1} \neq 0$

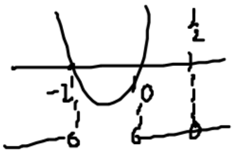
$\rightarrow x \neq -\frac{1}{3}$ ja $x \neq \frac{1}{2}$

Geom. sarja: $\left(-1 < \frac{2x-1}{3x+1} < 1\right)$ sama ehto: $\left|\frac{2x-1}{3x+1}\right| < 1$

$\rightarrow |2x-1| < |3x+1| \quad \|()^2$

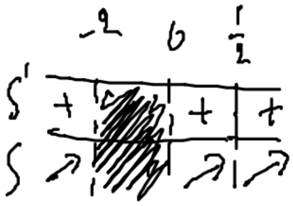
$(2x-1)^2 < (3x+1)^2$

$5x^2 + 10x > 0$

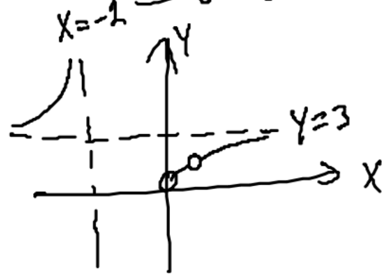


ei deriv. nollak.

suppenee kun $\boxed{x < -2 \text{ tai } 0 < x < \frac{1}{2} \text{ tai } x > \frac{1}{2}}$



$$S(x) = \frac{a_1}{1-q} = \frac{1}{1-\frac{2x-1}{3x+1}} = \frac{3x+1}{x+2}$$



$\lim_{x \to \frac{1}{2}} \frac{3x+1}{x+2} = 1$

$\lim_{x \to 0} \frac{3x+1}{x+2} = \frac{1}{2}$

$\rightarrow \frac{3+\frac{1}{x}}{1+\frac{2}{x}} = 3,\ x \to \pm\infty$ vaakas. asympt.