5.4 a) $\sum_{n=1}^{15} 3^n = \underset{a}{3^1} \xrightarrow{\cdot 3} 3^2 \xrightarrow{\cdot 3} 3^3 + \dots + 3^{15} = \frac{3(1-3^{15})}{1-3} = 21\ 523\ 359$

$\cdot 3 = q$

geometrinen summa

b) $\sum_{n=12}^{20} 3^n = 3^{12} + 3^{13} + 3^{14} + \dots + 3^{20} = \frac{3^{12}(1-3^{9})}{1-3} = 5\ 229\ 910\ 881$

5.6 $\underbrace{8 \xrightarrow{\cdot 1{,}2} 8\cdot 1{,}2 \xrightarrow{\cdot 1{,}2} 8\cdot 1{,}2^2 + \dots + 8\cdot 1{,}2^{n-1}}_{n \text{ kpl}} = \frac{8(1-1{,}2^n)}{\underbrace{1-1{,}2}_{-0{,}2}} < 1\,000\,000 = 10^6 \quad \Big| \cdot \overbrace{(-0{,}2)}^{<0}$

$\Leftrightarrow 8(1-1{,}2^n) > -0{,}2\cdot 10^6 \quad | : 8 > 0$ (*)

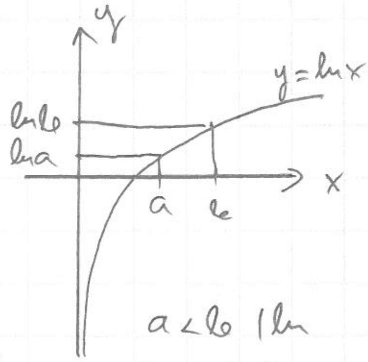
$\Leftrightarrow 1-1{,}2^n > -\frac{0{,}2}{8}\cdot 10^6$

$\Leftrightarrow 1 + \frac{0{,}2}{8}\cdot 10^6 > 1{,}2^n \quad | \ln$ (*)

$\Leftrightarrow \ln\left(1+\frac{0{,}2}{8}\cdot 10^6\right) > \ln 1{,}2^n = n \ln 1{,}2 \quad | : \ln 1{,}2 > 0$

$\Leftrightarrow \underbrace{\frac{\ln\left(1+\frac{0{,}2}{8}\cdot 10^6\right)}{\ln 1{,}2}}_{\approx 55{,}54} > n \quad \Rightarrow$ enintään 55 jäsentä

(*)



$a < b \mid \ln$

$\Leftrightarrow \ln a < \ln b$

ln x aidosti kasvava

→ järjestys säilyy

5.15 Geometrinen jono: $x \xrightarrow{\cdot q} x^2+1 \xrightarrow{\cdot q} x^3+3, \dots$

$q = \frac{x^2+1}{x} = \frac{x^3+3}{x^2+1} \quad | \times \quad x \neq 0$

$\Leftrightarrow (x^2+1)(x^2+1) = x(x^3+3)$

$\Leftrightarrow \cancel{x^4} + 2x^2 + 1 = \cancel{x^4} + 3x \quad \Leftrightarrow 2x^2 - 3x + 1 = 0 \quad \Leftrightarrow x = \begin{cases} 1 \\ \frac{1}{2} \end{cases}$

1° $\underline{x = 1}$: $\underline{1 \xrightarrow{\cdot 2} 2 \xrightarrow{\cdot 2} 4 \xrightarrow{\cdot 2} 8}$

2° $\underline{x = \frac{1}{2}}$: $\underline{\frac{1}{2} \xrightarrow{\cdot \frac{5}{2}} \frac{5}{4} \xrightarrow{\cdot \frac{5}{2}} \frac{25}{8} \xrightarrow{\cdot \frac{5}{2}} \frac{125}{16}}$

6. Summien sovelluksia

6.2 1.3. talletettu x vuoden lopussa : $x + x\cdot 0{,}0185 \cdot \frac{10}{12}$

1.4. —— " —— : $x + x\cdot 0{,}0185 \cdot \frac{9}{12}$

⋮

1.12. —— " —— : $x + x\cdot 0{,}0185 \cdot \frac{1}{12}$