

Tarefa 04 - Bernardo Rolden Soares Cardoso

$$1. a) \sum_{i=1}^n i = \frac{n \cdot (n+1)}{2}$$

$$b) \sum_{i=1}^n a^i = \frac{a^{n+1} - 1}{a - 1}$$

$$c) \sum_{i=1}^n i a^i = \frac{a^{n+1} (a^n - n - 1) + a}{(a - 1)^2}$$

$$\sum_{i=1}^n a^i = \frac{a^{n+1} - 1}{a - 1} \leftarrow \text{fatorar um } (-1) \text{ para } a$$

$$\sum_{i=1}^n \frac{d}{da} (a^i) \cdot a = \frac{d}{da} \left(\frac{a^{n+1} - 1}{a - 1} \right) \cdot a$$

$$\sum_{i=1}^n i a^i = \frac{d}{da} (a^{n+1} - 1) \cdot (a - 1) - (a^{n+1} - 1) \cdot \frac{d}{da} (a - 1)$$

$$= \left((n+1) \cdot a^n \cdot (a-1) - (a^{n+1} - 1) \cdot (1) \right) \cdot a$$

$$= (n a^{n+1} + a^n) \cdot (a-1) - a^{n+1} + 1$$

$$= n a^{n+1} - n a^n + a^{n+1} - a^n - a^{n+1} + 1$$

$$= a (n a^{n+1} - n a^n - a^n + 1)$$

$$= \frac{a^{n+1} (a^n - n - 1) + a}{(a - 1)^2}$$

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$$a) \sum_{i=1}^n \frac{1}{i} = 1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n}$$

$H_n \rightarrow$ Harmonic numbers

Exercício pede a soma de $n=1$, a número harmônico num é inteiro

por definição, a número harmônico satisfaz a relação de recorrência:

$$H_{n+1} = H_n + \frac{1}{n+1}$$

Os número harmônicos satisfazem a identidade!

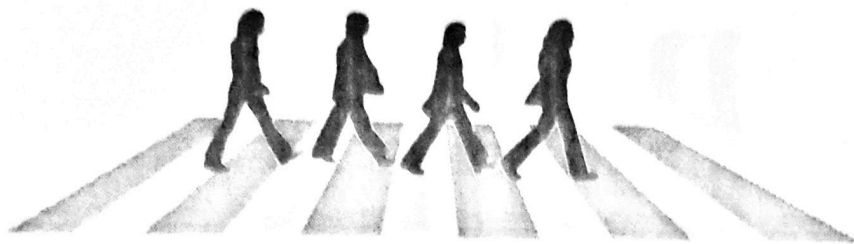
$$\sum_{i=1}^n \frac{1}{i} = (n+1) \cdot H_n - n$$

$$e) \sum_{i=1}^3 i 2^{-i} = \sum_{i=1}^n i \cdot \left(\frac{1}{2}\right)^i$$

$$\sum_{i=1}^n i a^i = \frac{a^{n+1} (a n - n - 1) + a}{(a-1)^2}$$

$$a = \frac{1}{2}$$

$$\sum_{i=1}^3 i \left(\frac{1}{2}\right)^i = \left(\frac{1}{2}\right)^{n+1} \cdot \left[\left(\frac{1}{2}\right) \cdot n - n - 1\right] + \frac{1}{2}$$



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$$1) \sum_{i=0}^{\infty} \frac{1}{7^i} = 1 + \frac{1}{7} + \frac{1}{49} + \dots + \left(\frac{1}{7}\right)^n$$

$$\sum_{i=0}^{\infty} \left(\frac{1}{7}\right)^i$$

$$\sum_{i=0}^{\infty} a^i = \frac{a^{n+1} - 1}{a - 1}, \quad a = \frac{1}{7}$$

$$\sum_{i=0}^{\infty} \left(\frac{1}{7}\right)^i = \frac{\left(\frac{1}{7}\right)^{n+1} - 1}{\frac{1}{7} - 1}$$