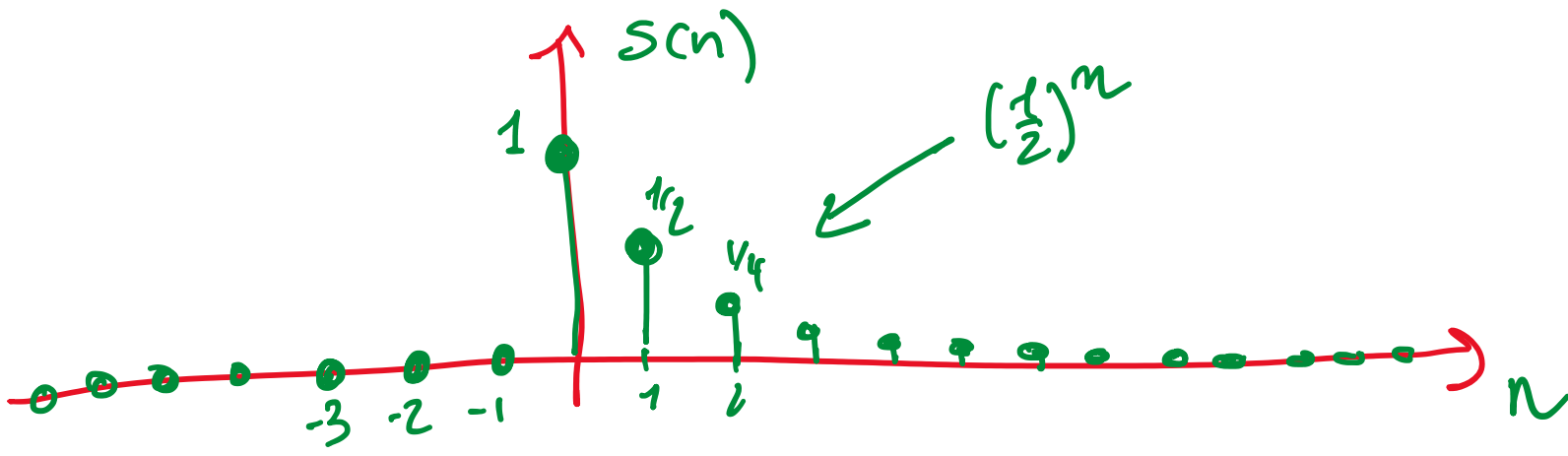


Es1  $A_s, m_s, E_s, P_s \in \mathbb{R} \quad s(n) = \left(\frac{1}{2}\right)^n 1_0(n)$



$$A_s = \sum_{n=-\infty}^{+\infty} \left(\frac{1}{2}\right)^n 1_0(n)$$

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

SERIE GEOMETRICA

$$\sum_{n=0}^{N-1} \alpha^n = \frac{1 - \alpha^N}{1 - \alpha}$$

$$\sum_{n=0}^{+\infty} \alpha^n = \frac{1}{1 - \alpha} \quad |\alpha| < 1$$

$$m_s = 0$$

$$|s(n)|^2 = \left|\left(\frac{1}{2}\right)^n\right|^2 \cdot |1_0(n)|^2 = \left(\frac{1}{2}\right)^{2n} \cdot 1_0(n) = \left(\frac{1}{4}\right)^n \cdot 1_0(n)$$

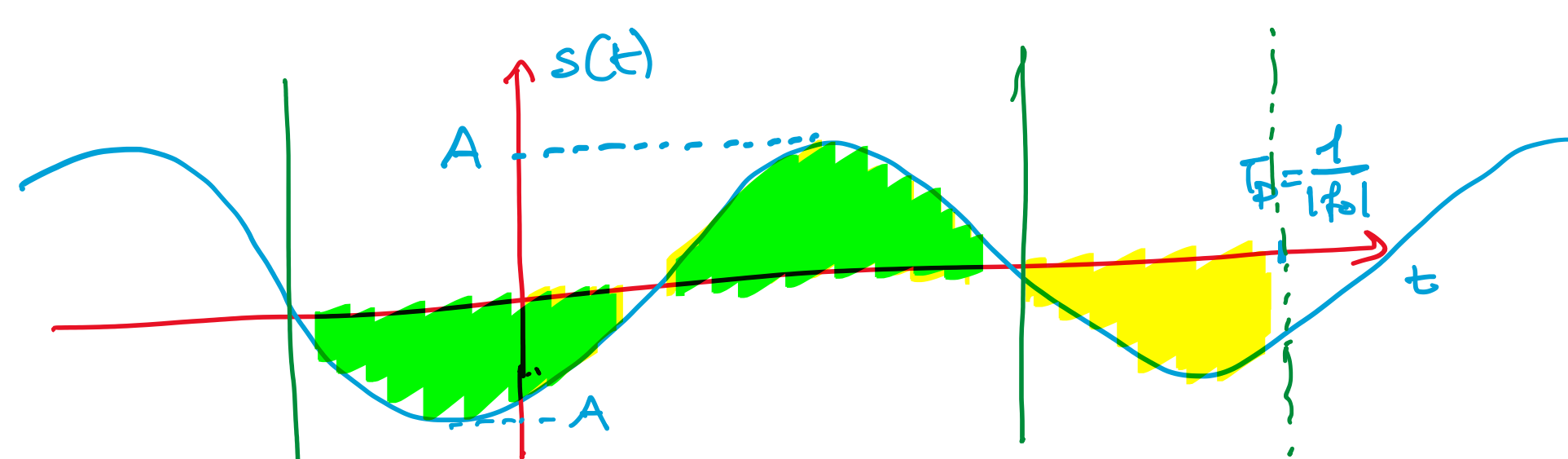
$$1_0(n) = \begin{cases} 1 & n \geq 0 \\ 0 & n < 0 \end{cases}$$

$$(1_0(n))^2 = \begin{cases} 1 & n \geq 0 \\ 0 & n < 0 \end{cases} = 1_0(n)$$

$$E_s = \sum_{n=-\infty}^{+\infty} \left(\frac{1}{4}\right)^n 1_0(n) = \frac{1}{1 - \frac{1}{4}} = \frac{4}{3}$$

$$P_s = 0$$

Es2  $m_s, P_s \in \mathbb{R} \quad s(t) = A \cos(2\pi f_0 t + \varphi_0)$   
 $A > 0 \quad f_0 \neq 0$



$$m_s = \frac{A_s(T_0)}{T_0}$$

$$A_s(T_0) = \int_0^{T_0} A \cos(2\pi f_0 t + \varphi_0) dt = 0$$

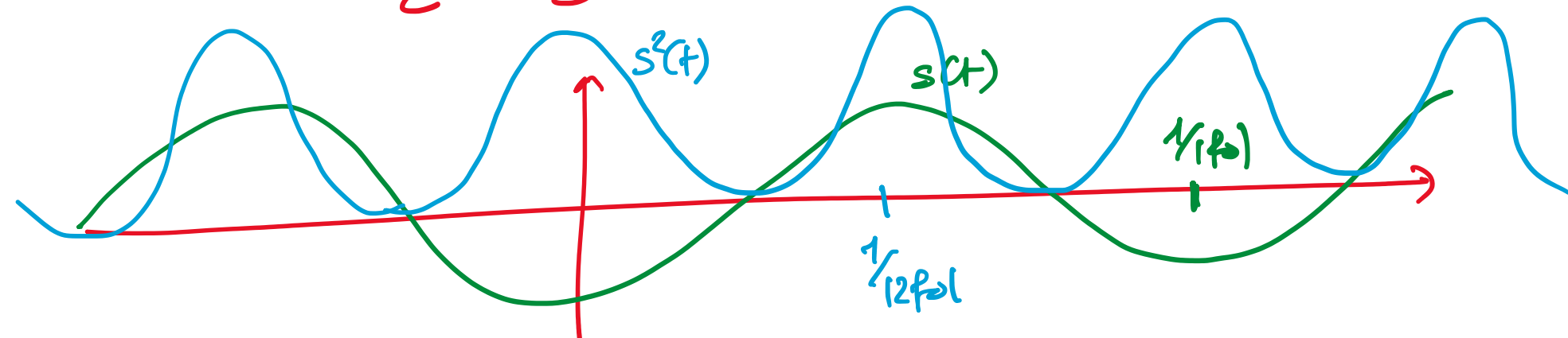
$$m_s = 0$$

$$|s(t)|^2 = A^2 \cos^2(2\pi f_0 t + \varphi_0)$$

$$\cos^2 \alpha = \frac{1 + \cos 2\alpha}{2}$$

$$\cos \alpha = \frac{e^{j\alpha} + e^{-j\alpha}}{2}$$

$$= \frac{A^2}{2} + \frac{A^2}{2} \cos(2\pi \cdot 2f_0 \cdot t + 2\varphi_0)$$



$$P_s = \frac{A^2}{2}$$

Es3  $m_s, P_s \in \mathbb{C} \quad s(t) = A e^{j2\pi f_0 t}$   $f_0 \neq 0$   
 Areaale

$$s(t) = A \cos(2\pi f_0 t) + j A \sin(2\pi f_0 t)$$

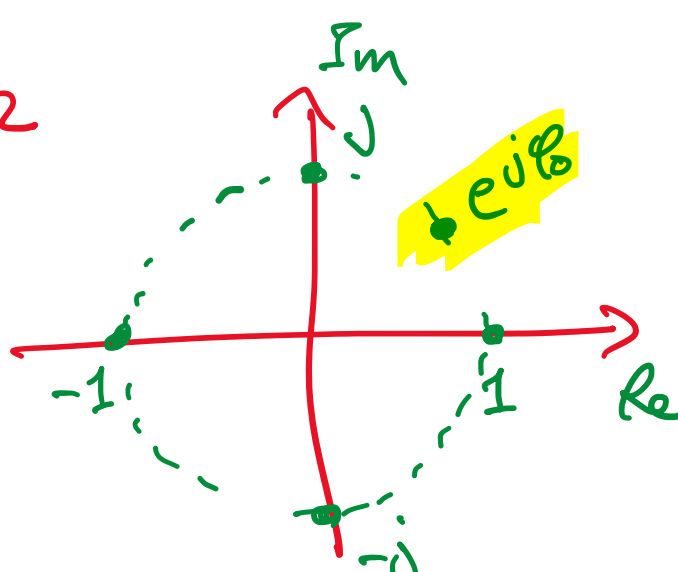
$$m_s = 0$$

NOTA  $A \in \mathbb{C}$  complesso  $A = |A| e^{j\varphi_A}$   
 $s(t) = |A| e^{j(2\pi f_0 t + \varphi_A)}$

$$|s(t)|^2 = |A|^2 \cdot |e^{j2\pi f_0 t}|^2$$

$$= |A|^2$$

$$P_s = |A|^2$$



Es4  $m_s, P_s \in \mathbb{C} \quad s(t) = A_1 e^{j2\pi f_1 t} + A_2 e^{j2\pi f_2 t}$   
 $f_2 \neq f_1 \quad f_1, f_2 \neq 0$   
 $m_s = 0$

$$|x|^2 = x \cdot x^*$$

$$|s(t)|^2 = (A_1 e^{j2\pi f_1 t} + A_2 e^{j2\pi f_2 t}) \cdot (A_1^* e^{-j2\pi f_1 t} + A_2^* e^{-j2\pi f_2 t})$$

$$= A_1 A_1^* e^{j2\pi f_1 t} e^{-j2\pi f_1 t} + A_1 A_2^* e^{j2\pi f_1 t} e^{-j2\pi f_2 t} + A_2 A_1^* e^{j2\pi f_2 t} e^{-j2\pi f_1 t} + A_2 A_2^* e^{j2\pi f_2 t} e^{-j2\pi f_2 t}$$

$$e^{j\alpha} \cdot e^{j\beta} = e^{j(\alpha+\beta)}$$

$$|s(t)|^2 = |A_1|^2 + A_1 A_2^* e^{j2\pi(f_1 - f_2)t} + A_2 A_1^* e^{j2\pi(f_2 - f_1)t} + |A_2|^2$$

$$f_1 \neq f_2$$

$$P_s = |A_1|^2 + 0 + 0 + |A_2|^2$$

$$= |A_1|^2 + |A_2|^2$$