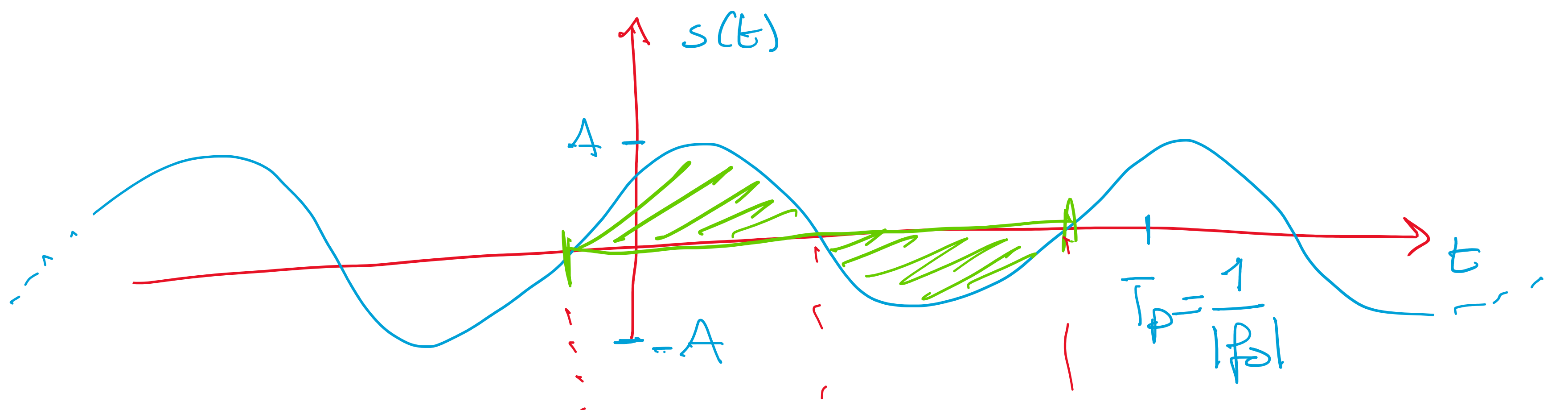
Le3

Thursday, 2 March 2023 08:57

ES CALCOLARE m_s E P_s DEL SEGNALE

$$s(t) = A\cos(2\pi f_0 t + \varphi_0), \quad A>0$$



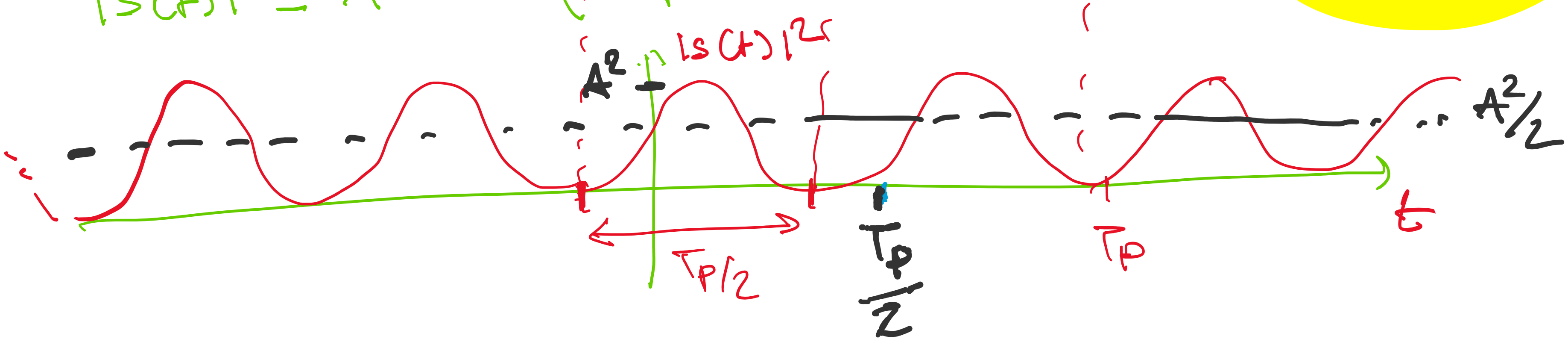
$A_s(T_p) = 0$

$m_s = 0$

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

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

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



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

$$T_p' = \frac{1}{2|f_0|} = \frac{T_p}{2}$$

$$E_s(T_p) = \int_0^{T_p} |s(t)|^2 dt = \frac{A^2}{2}T_p + 0 = \frac{A^2}{2}T_p$$

$P_s = \frac{A^2}{2}$ $\quad m_s = 0$

ES CALCOLARE PERIODICITÀ, m_s, P_s DI $s(t) = A_1 e^{j2\pi f_1 t} + A_2 e^{j2\pi f_2 t}$

$s_1(t)$, $s_2(t)$

$A_1, A_2 \in \mathbb{C}$

$\rightarrow$ $A_1 = |A_1| e^{j\varphi_1}$

$A_2 = |A_2| e^{j\varphi_2}$

$f_1 \neq f_2$

$f_1, f_2 \neq 0$

PERIODICITÀ? PERIODICO SOLO SE f_1/f_2 È RAZIONALE

VALOR MEDIO $m_s = A_1 m_{s_1} + A_2 m_{s_2} = 0$

NOTA SE FOSSE $f_1 = 0$

$s_1(t) = e^{j2\pi f_1 t} = 1$

$m_{s_1} = 1$

$f_2 \neq f_1$

$m_s = A_1$

POTENZA

$|s(t)|^2 \leftarrow$

$$s(t) = |A_1| e^{j(2\pi f_1 t + \varphi_1)} + |A_2| e^{j(2\pi f_2 t + \varphi_2)}$$

$$s^*(t) = |A_1| e^{-j(2\pi f_1 t + \varphi_1)} + |A_2| e^{-j(2\pi f_2 t + \varphi_2)}$$

$$|s(t)|^2 = s(t)\, s^*(t)$$

$$= |A_1|^2 e^{j(2\pi \cancel{f_1 t} + \varphi_1)} e^{-j(2\pi \cancel{f_1 t} + \varphi_1)}$$

$$+ |A_2|^2$$

$$+ |A_1||A_2|\, \underbrace{e^{j(2\pi f_1 t + \varphi_1)} e^{-j(2\pi f_2 t + \varphi_2)}}_{e^{j(2\pi(f_1 - f_2)t + \varphi_1 - \varphi_2)}}$$

$$+ |A_1||A_2|\, \underbrace{e^{-j(2\pi f_1 t + \varphi_1)} e^{j(2\pi f_2 t + \varphi_2)}}_{e^{-j(2\pi(f_1 - f_2)t + \varphi_1 - \varphi_2)}}$$

$$= |A_1|^2 + |A_2|^2 + 2|A_1||A_2|\cos(2\pi(f_1 - f_2)t + \varphi_1 - \varphi_2)$$

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