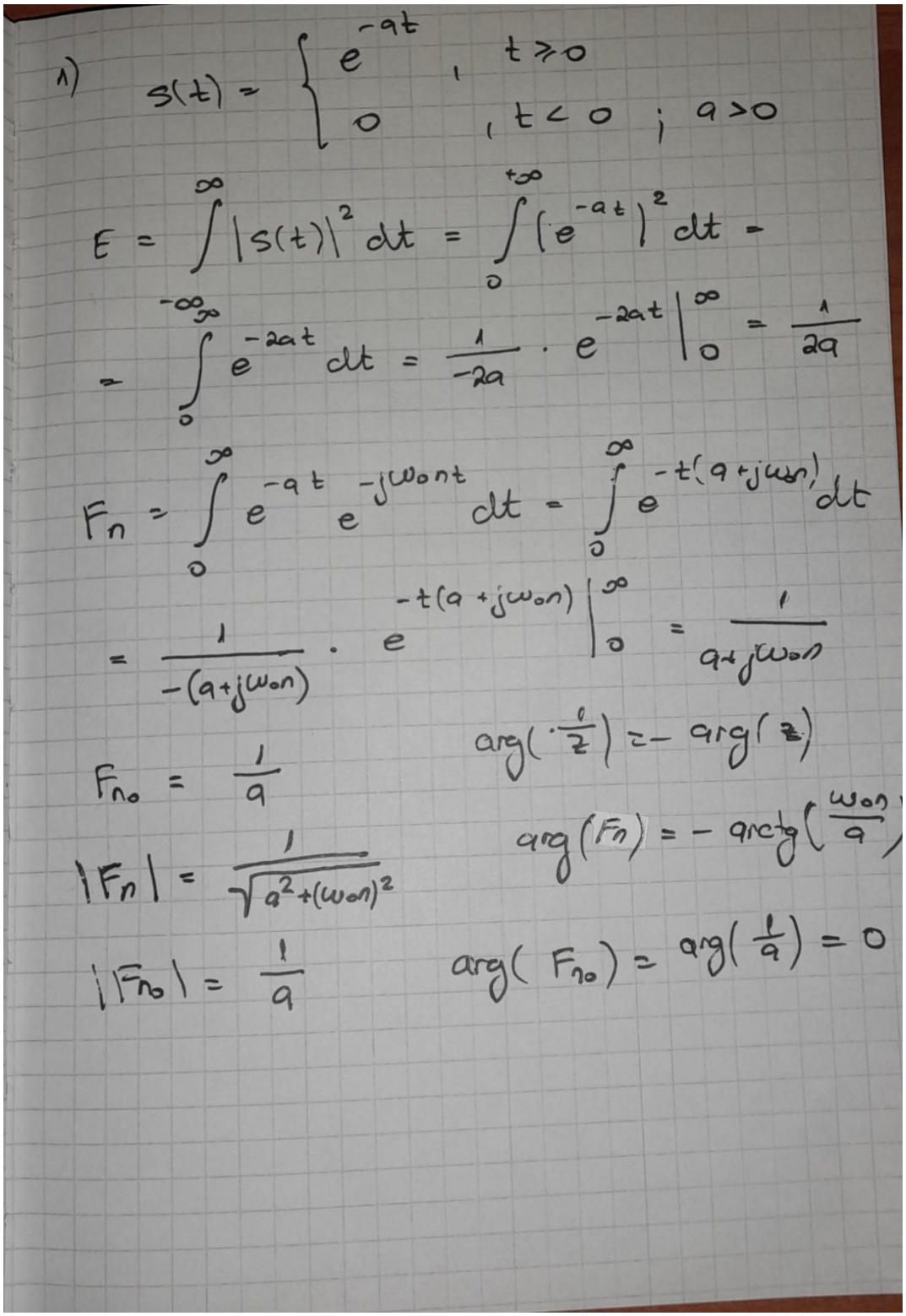
Priprema za četvrtu laboratorijsku vježbu – Jelena Matijaš 1102/23



1) $s(t) = \begin{cases} e^{-at}, & t \geq 0 \\ 0, & t < 0 \end{cases}; \quad a > 0$

$$E = \int_{-\infty}^{\infty} |s(t)|^2 \, dt = \int_{0}^{+\infty} \left(e^{-at}\right)^2 dt =$$

$$= \int_{0}^{\infty} e^{-2at} \, dt = \frac{1}{-2a} \cdot e^{-2at} \Big|_0^{\infty} = \frac{1}{2a}$$

$$F_n = \int_0^{\infty} e^{-at} e^{-j\omega_0 n t} \, dt = \int_0^{\infty} e^{-t(a+j\omega_0 n)} \, dt$$

$$= \frac{1}{-(a+j\omega_0 n)} \cdot e^{-t(a+j\omega_0 n)} \Big|_0^{\infty} = \frac{1}{a+j\omega_0 n}$$

$$F_{n_0} = \frac{1}{a}$$

$$|F_n| = \frac{1}{\sqrt{a^2+(\omega_0 n)^2}}$$

$$|F_{n_0}| = \frac{1}{a}$$

$$\arg\left(\frac{1}{z}\right) = -\arg(z)$$

$$\arg(F_n) = -\operatorname{arctg}\left(\frac{\omega_0 n}{a}\right)$$

$$\arg(F_{n_0}) = \arg\left(\frac{1}{a}\right) = 0$$

2) $s(t) = \begin{cases} A, & 0 \le t \le \tau \\ 0, & t < 0 \wedge t > \tau \end{cases}$

$$E = \int_{-\infty}^{\infty} |s(t)|^2 dt = \int_{0}^{\tau} A^2 dt = A^2 \tau$$

3) Парсевалова теорема за непериодични сигнали:

$$E = \frac{1}{2\pi} \int_{-\infty}^{\infty} |F(\omega)|^2 d\omega = \int_{-\infty}^{\infty} |F(2\pi f)|^2 df$$

$|F(f)|^2 \rightarrow \left[\frac{Ws}{Hz}\right] \leftrightarrow \left[\frac{J}{Hz}\right]$

↓ спектрална густина енергије по фреквенцији