1. $x(t) = \sin(\omega_0 t) \cdot \left[\mu(t) - \mu\left(t - \frac{2\pi}{\omega_0}\right)\right]$

(a) $X(j\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt = \int_{0}^{\frac{2\pi}{\omega_0}} \sin(\omega_0 t) e^{-j\omega t} dt = \ldots =$

$$= \boxed{\frac{\omega_0 \left(1 - e^{-j\frac{2\pi\omega}{\omega_0}}\right)}{\omega_0^2 - \omega^2}}$$

(b) $\omega_0 = 2\pi \Rightarrow X(j\omega) = \dfrac{2\pi\left(1 - e^{-j\omega}\right)}{4\pi^2 - \omega^2}$, $\quad e^{-j\omega} \to \cos\omega - j\sin\omega$

$$\boxed{|X(j\omega)|} = 2\pi \frac{\sqrt{(1-\cos\omega)^2 + \sin^2\omega}}{|4\pi^2 - \omega^2|} = \boxed{\frac{2\pi\sqrt{2 - 2\cos\omega}}{|4\pi^2 - \omega^2|}}$$

$$\boxed{|X(j\pi)|} = \frac{2\pi\sqrt{4}}{3\pi^2} = \boxed{\frac{4}{3\pi}}$$

1. e) $\boxed{E} = \int_{-\infty}^{\infty} |x(t)|^2 dt = \int_0^{\frac{2\pi}{\omega_0}} \sin^2(\omega_0 t)\, dt =$

$$= \int_0^{\frac{2\pi}{\omega_0}} \frac{1-\cos(2\omega_0 t)}{2} dt = \frac{1}{2}\cdot\frac{2\pi}{\omega_0} - \frac{1}{2}\cdot \frac{\sin(2\omega_0 t)}{2\omega_0}\Bigg|_0^{\frac{2\pi}{\omega_0}} =$$

$$= \frac{\pi}{\omega_0} - \frac{1}{4\omega_0}\left(\sin(4\pi) - \sin(0)\right) = \boxed{\frac{\pi}{\omega_0}}$$

(d) Signal je realan $\Rightarrow$ vrijedi $X^*(j\omega) = X(-j\omega)$.

$$X^*(j\omega) = \left(\frac{\omega_0\left(1 - e^{-j\frac{2\pi\omega}{\omega_0}}\right)}{\omega_0^2 - \omega^2}\right)^* = \frac{\omega_0}{\omega_0^2-\omega^2}\left(1 - e^{j\frac{2\pi\omega}{\omega_0}}\right)$$

$$X(-j\omega) = \frac{\omega_0\left(1 - e^{j\frac{2\pi}{\omega_0}(-\omega)}\right)}{\omega_0^2 - (-\omega)^2} = \frac{\omega_0}{\omega_0^2-\omega^2}\left(1 - e^{j\frac{2\pi\omega}{\omega_0}}\right)$$

2. $x(t) = e^{-|2t+1|}$

a) $$\boxed{X(j\omega)} = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt = \int_{-\infty}^{-\frac{1}{2}} e^{2t+1} e^{-j\omega t} dt +$$

$$+ \int_{-\frac{1}{2}}^{\infty} e^{-2t-1} e^{-j\omega t} dt = \frac{j e^{j\frac{\omega}{2}}}{\omega + j2} - \frac{j e^{j\frac{\omega}{2}}}{\omega - j2} =$$

$$= j e^{j\frac{\omega}{2}} \frac{\omega - j2 - \omega - j2}{\omega^2 + 4} = \boxed{\frac{4 e^{j\frac{\omega}{2}}}{\omega^2 + 4}}$$

ili preko službenog šalabahtera:

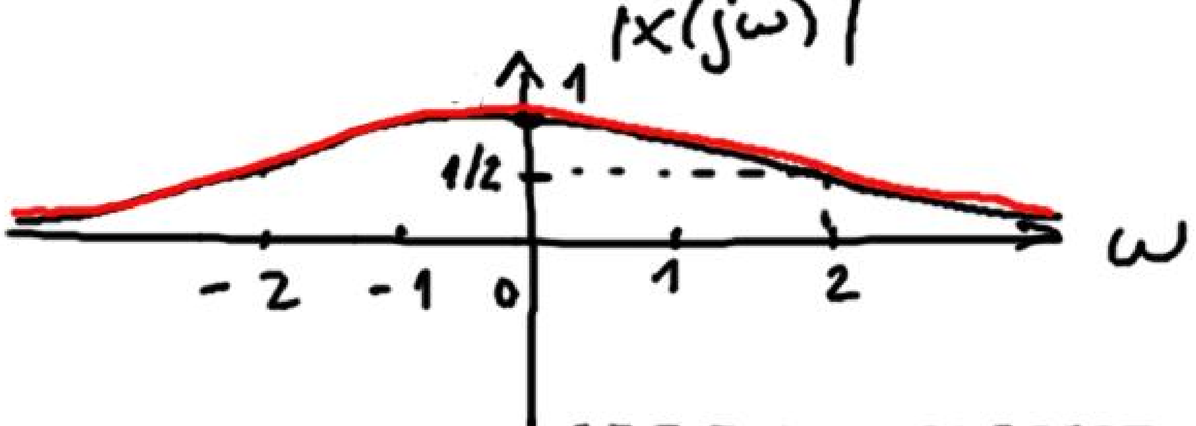
$$e^{-a|t|} \circ\!\!-\!\!\bullet \frac{2a}{a^2 + \omega^2} \Rightarrow e^{-2|t|} \circ\!\!-\!\!\bullet \frac{2 \cdot 2}{2^2 + \omega^2} = \frac{4}{4 + \omega^2}$$

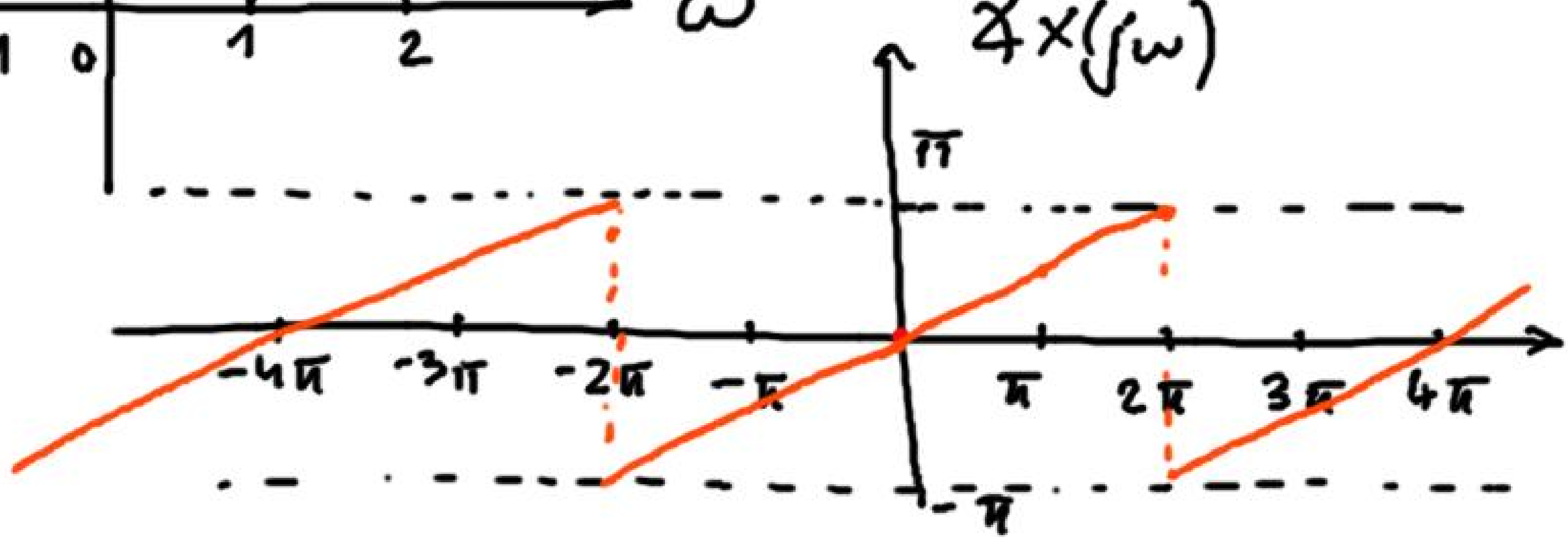
$$x(t - t_0) \circ\!\!-\!\!\bullet X(j\omega) e^{-j\omega t_0} = \frac{4}{4 + \omega^2} \cdot e^{-j\omega \cdot (-\frac{1}{2})} = \boxed{\frac{4 e^{j\frac{\omega}{2}}}{\omega^2 + 4}}$$

1. b) $X(j\omega) = \dfrac{4e^{j\frac{\omega}{2}}}{\omega^2+4} = |X(j\omega)| \cdot e^{j\measuredangle X(j\omega)}$

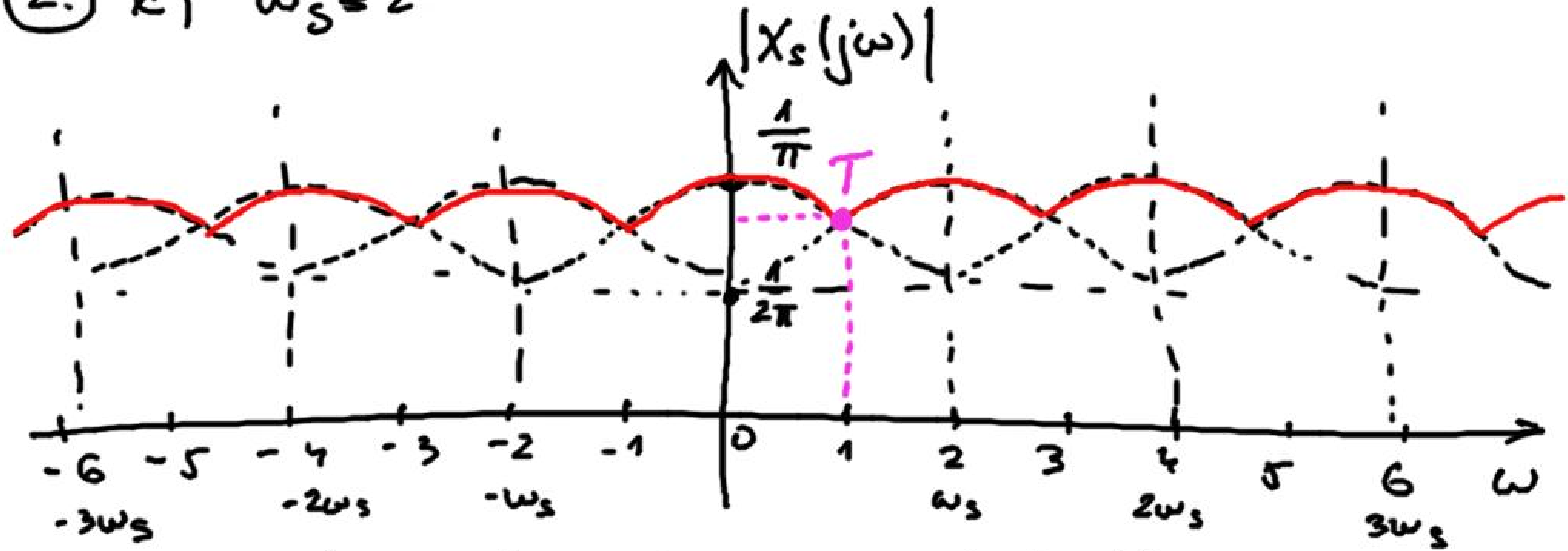
$$|X(j\omega)| = \left|\frac{4e^{j\frac{\omega}{2}}}{\omega^2+4}\right| = \frac{|4e^{j\frac{\omega}{2}}|}{|\omega^2+4|} = \frac{4}{\omega^2+4}$$

$\measuredangle X(j\omega) = \dfrac{\omega}{2}$ (unutar $(-\pi, \pi)$ uvijek neka bude)





2. c) $\omega_s = 2$



$$|X_s(j\omega)| = \frac{|X(j\omega)|}{T_s} = \frac{|X(j\omega)|}{\frac{2\pi}{\omega_s}} = \frac{|X(j\omega)|}{\pi}$$

$\omega = 1 \Rightarrow$ (ljubičasta točka na grafu)

$$\boxed{|X_s(j1)|} = \frac{|X(j1)|}{\pi} = \frac{\frac{4}{1^2+4}}{\pi} = \boxed{\frac{4}{5\pi}}$$

2. d) $$\boxed{E} = \int_{-\infty}^{\infty} |x(t)|^2 dt = \int_{-\infty}^{-\frac{1}{2}} e^{4t+2} dt + \int_{-\frac{1}{2}}^{\infty} e^{-4t-2} dt =$$

$$= \quad \ldots \quad = \frac{1}{4} + \frac{1}{4} = \boxed{\frac{1}{2}}$$

e) $$y(t) = x\left(t - \tfrac{1}{2}\right) = e^{-|2(t-\frac{1}{2})+1|} = e^{-|2t|} = e^{-2|t|}$$

$\boxed{Y(j\omega)}$ = (služben šalabahter → $e^{-a|t|} \circ\!\!-\!\!\bullet \dfrac{2a}{a^2+\omega^2}$) $= \boxed{\dfrac{4}{\omega^2+4}}$

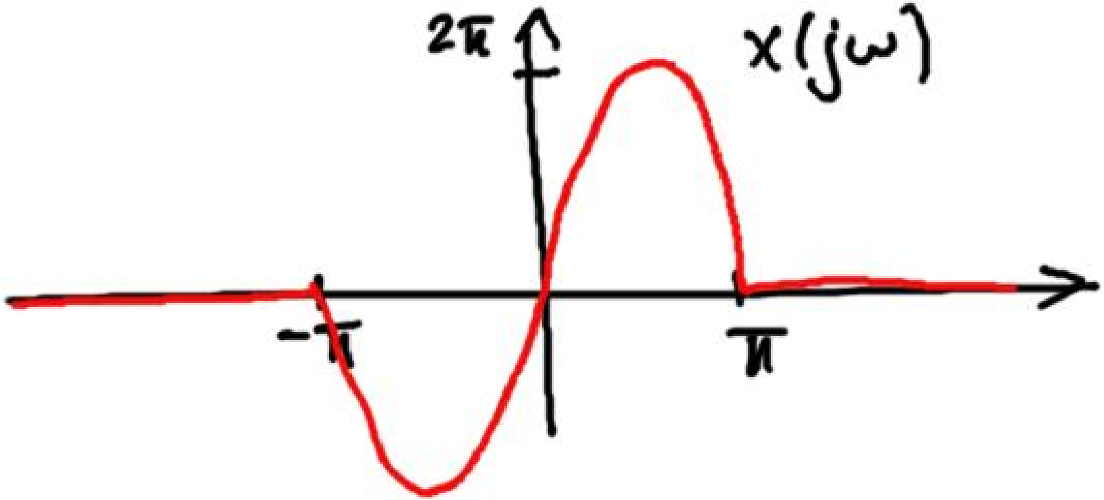
ili

$$y(t) = x\left(t - \tfrac{1}{2}\right) \circ\!\!-\!\!\bullet X(j\omega) \cdot e^{-j\omega\frac{1}{2}} = \frac{4e^{j\frac{\omega}{2}}}{\omega^2+4} \cdot e^{-j\frac{\omega}{2}} = \boxed{\frac{4}{\omega^2+4}}$$

(2.) f) Signal y(t) je realan i paran $\rightarrow Y^*(j\omega) = Y(j\omega)$

$$Y^*(j\omega) = \left(\frac{4}{\omega^2+4}\right)^* = \frac{4}{\omega^2+4} = Y(j\omega)$$

3.

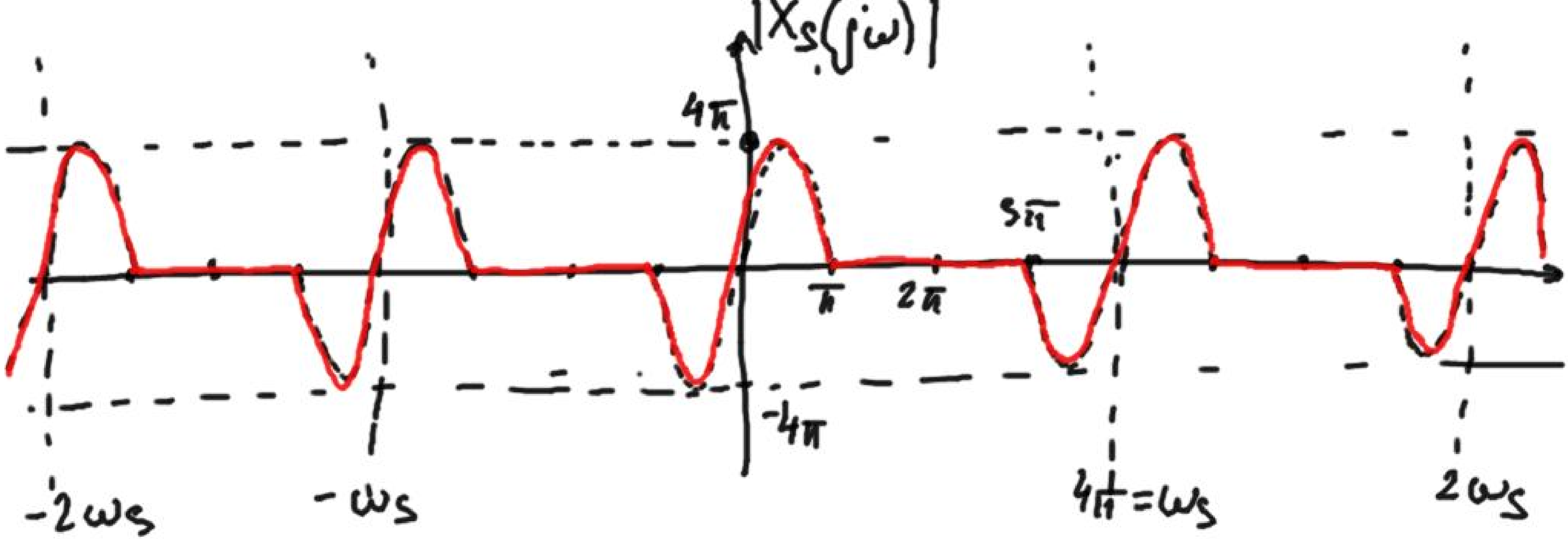


(a) $\boxed{x(t)} = \frac{1}{2\pi}\int_{-\infty}^{\infty} X(j\omega)\, e^{j\omega t}\, dt = \frac{1}{2\pi}\int_{-\pi}^{\pi} 2\pi \sin(\omega)\, e^{j\omega t}\, d\omega =$

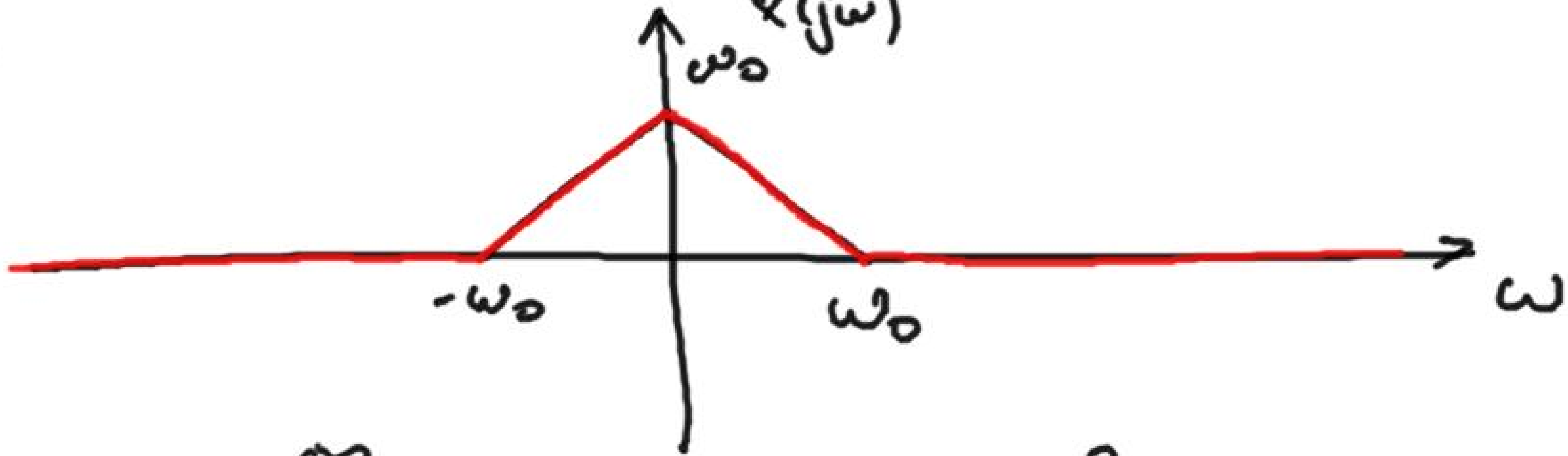
$= \ldots = \boxed{-\frac{2j\sin(\pi t)}{t^2-1}}$

(b) $\boxed{E} = \frac{1}{2\pi}\int_{-\infty}^{\infty} |X(j\omega)|^2\, d\omega = \frac{1}{2\pi}\int_{-\pi}^{\pi} 4\pi^2 \sin^2(\omega)\, d\omega = \ldots = \boxed{2\pi^2}$

(3.) a) $|X_s(j\omega)| = \dfrac{|X(j\omega)|}{T_s} = \dfrac{|X(j\omega)|}{\frac{1}{2}}$ $\qquad \omega_s = \dfrac{2\pi}{T_s} = 4\pi$



4.



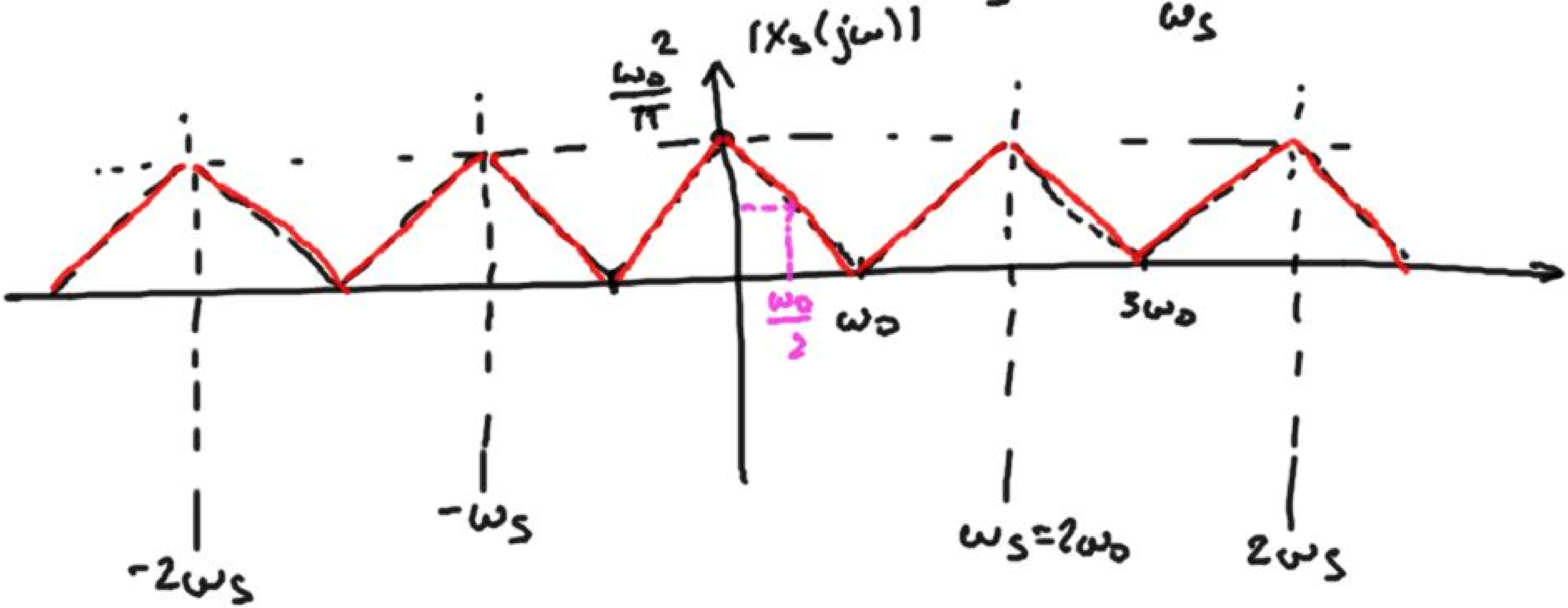
$$\text{(a)}\ \boxed{x(t)} = \frac{1}{2\pi}\int_{-\infty}^{\infty} X(j\omega)\, e^{j\omega t}\, d\omega = \frac{1}{2\pi}\left(\int_{-\omega_0}^{0}(\omega+\omega_0)e^{j\omega t}\, d\omega + \right.$$

$$\left. + \int_{0}^{\omega_0}(-\omega+\omega_0)e^{j\omega t}\, d\omega \right) = \ldots = \boxed{\frac{1-\cos(\omega_0 t)}{\pi t^2}}$$

$$\text{(b)}\ \boxed{E} = \frac{1}{2\pi}\int_{-\infty}^{\infty} |X(j\omega)|^2\, d\omega = \frac{1}{2\pi}\left(\int_{-\omega_0}^{\omega} |\omega+\omega_0|^2\, d\omega + \int_{0}^{\omega_0} |-\omega+\omega_0|^2\, d\omega\right) =$$

$$= \ldots = \boxed{\frac{\omega_0^3}{3\pi}}$$

4. c) $\omega_s = 2\omega_0$ $\quad |X_s(j\omega)| = \frac{|X(j\omega)|}{T_s} = \frac{|X(j\omega)|}{\frac{2\pi}{\omega_s}} = \frac{\omega_0}{\pi}|X(j\omega)|$

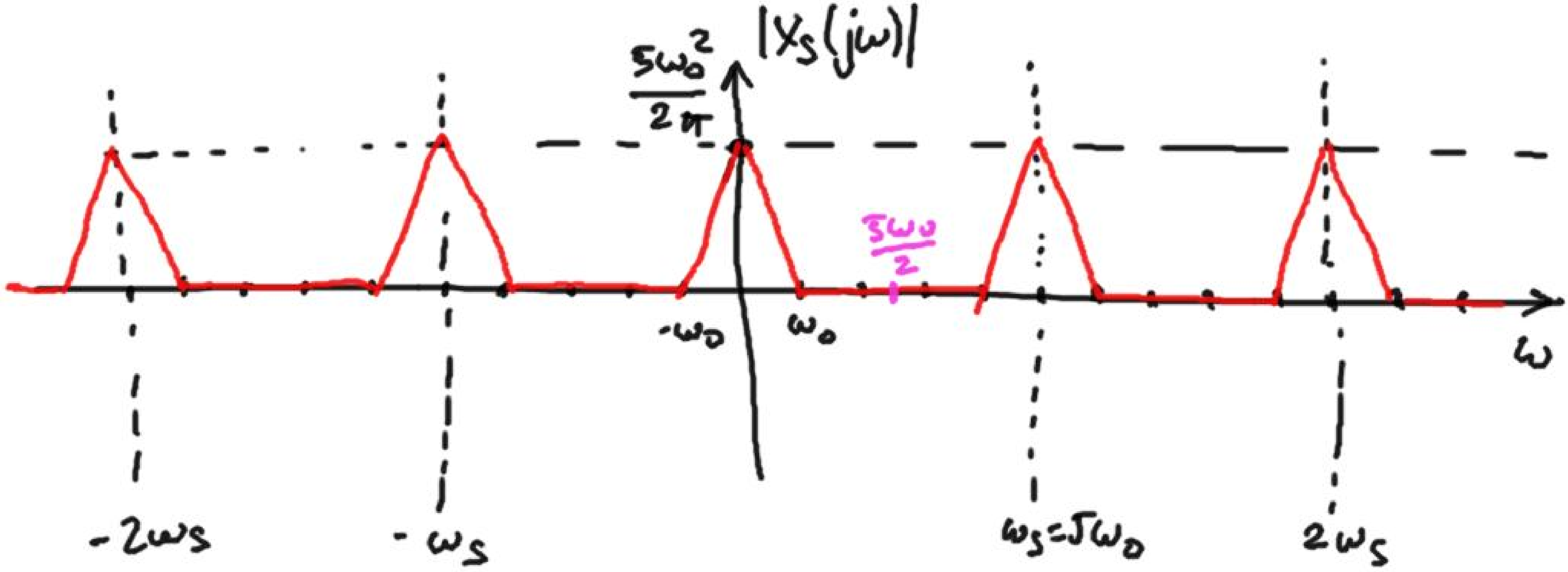


$\boxed{\left|X_s\left(j\frac{\omega_0}{2}\right)\right|}$ = (ljubičasta točka na grafu) =

$$= \frac{\omega_0}{\pi} \cdot \left|X\left(j\frac{\omega_0}{2}\right)\right| = \frac{\omega_0}{\pi} \cdot (-\omega + \omega_0)\Big|_{\omega = \frac{\omega_0}{2}} =$$

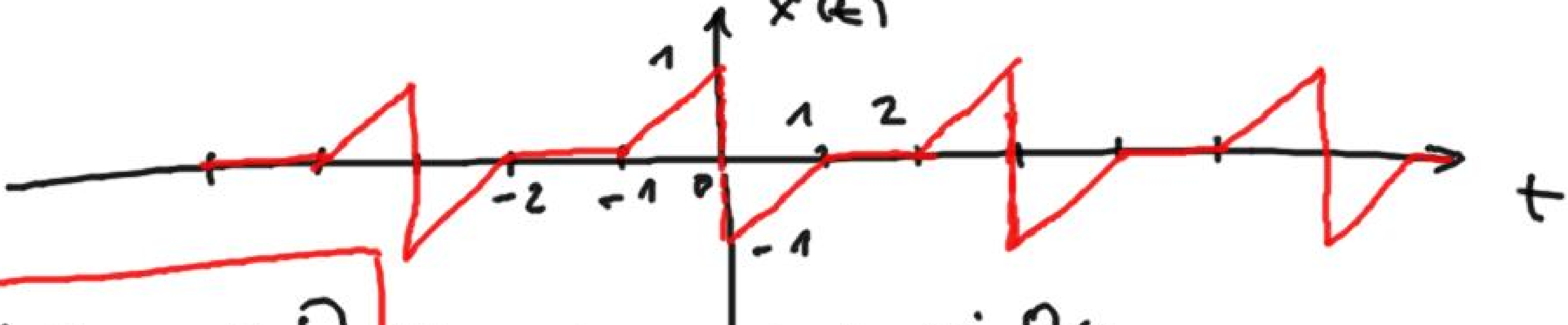
$$= \frac{\omega_0}{\pi} \cdot \left(-\frac{\omega_0}{2} + \omega_0\right) = \boxed{\frac{\omega_0^2}{2\pi}}$$

4. d) $\omega_s = 5\omega_0 \rightarrow |X_s(j\omega)| = \frac{|X(j\omega)|}{T_s} = \frac{|X(j\omega)|}{\frac{2\pi}{\omega_s}} = \frac{5\omega_0}{2\pi}|X(j\omega)|$



$\boxed{|X_s(j\frac{5\omega_0}{2})|}$ = (ljub. točka) = $\boxed{0}$

5. a) Kontinuiran i periodičan → CTFS



$\boxed{X_0 = \ldots = 0}$ → srednja vrijednost je 0

$$\boxed{X_k} = \frac{1}{T_0}\int_{T_0} x(t)e^{-j\omega_0 kt}\,dt = \frac{1}{4}\left(\int_{-1}^{0}(t+1)e^{-j\omega_0 kt}\,dt + \int_{0}^{1}(t-1)e^{-j\omega_0 kt}\,dt\right) = \frac{1}{4}\,\frac{2j\,(k\omega_0 - \sin(k\omega_0))}{k^2\omega_0^2} =$$

$$= \left[\omega_0 = \frac{2\pi}{T_0} = \frac{2\pi}{4} = \frac{\pi}{2}\right] = \boxed{2j\,\frac{\left(k\frac{\pi}{2} - \sin\left(k\frac{\pi}{2}\right)\right)}{k^2\pi^2},\ k \neq 0}$$

5\. b) $\boxed{P} = \frac{1}{T_0}\int_{T_0} |x(t)|^2 dt = \frac{1}{4}\left(\int_{-1}^{0} (t+1)^2 dt + \int_{0}^{1} (t-1)^2 dt\right) =$

zbog apsolutne vrijednosti se promijeni

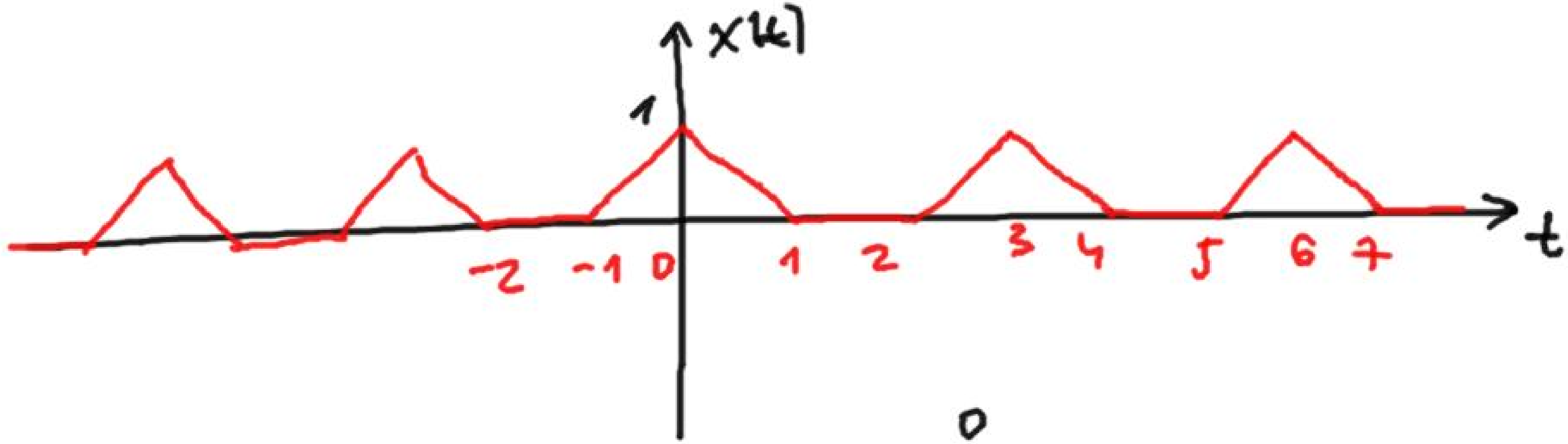
$= \dots = \boxed{\frac{1}{6}}$

c) signal je realan $\rightarrow X_k^* = X_{-k}$

$$X_k^* = \left(2j\,\frac{\left(k\frac{\pi}{2} - \sin\left(k\frac{\pi}{2}\right)\right)}{k^2\pi^2}\right)^* = -2j\cdot\frac{k\frac{\pi}{2} - \sin\left(\frac{k\pi}{2}\right)}{k^2\pi^2}$$

$$X_{-k} = 2j\,\frac{\left(-k\frac{\pi}{2} - \sin\left(-k\frac{\pi}{2}\right)\right)}{(-k)^2\pi^2} = -2j\cdot\frac{k\frac{\pi}{2} - \sin\left(\frac{k\pi}{2}\right)}{k^2\pi^2}$$

6. a) Kontinuiran i periodičan → CTFS



$$\boxed{X_k} = \frac{1}{T_0}\int_{T_0} x(t) e^{-j\omega_0 k t} dt = \frac{1}{4}\left(\int_{-1}^{0}(t+1)e^{-j\omega_0 k t}dt + \int_{0}^{1}(-t+1)e^{-j\omega_0 k t}dt\right) = \frac{2\left(1-\cos(k\omega_0)\right)}{4k^2\omega_0^2} =$$

$$= \boxed{2\,\frac{1-\cos\left(k\frac{\pi}{2}\right)}{k^2\pi^2}\,,\ k \neq 0}$$

$$\boxed{X_0} = \frac{1}{4}\left(\int_{-1}^{0}(t+1)dt + \int_{0}^{1}(-t+1)dt\right) = \boxed{\frac{1}{4}}$$

6. b) $\boxed{P} = \frac{1}{T_0}\int_{T_0} |x(t)|^2 dt = \frac{1}{4}\left(\int_{-1}^{0} |t+1|^2 dt + \int_{0}^{1} |-t+1|^2 dt\right) =$

$= \ldots = \boxed{\frac{1}{6}}$

c) signal je realan i paran $\Rightarrow X_k^* = X_k$

$$\boxed{X_k^*} = \left(2\,\frac{1-\cos\left(\frac{k\pi}{2}\right)}{k^2\pi^2}\right)^* = 2\,\frac{1-\cos\left(\frac{k\pi}{2}\right)}{k^2\pi^2} = \boxed{X_k}$$

7. a)

$$\boxed{x(t)} = \sum_{\ell=-\infty}^{\infty} X_\ell e^{j\omega_0 \ell t} =$$

$$= X_{-4} e^{-j4\omega_0 t} + X_{-2} e^{-j2\omega_0 t} + X_0 + X_2 e^{j2\omega_0 t} +$$

$$+ X_4 e^{j4\omega_0 t} = \frac{j}{4} e^{-j4\omega_0 t} + \frac{1}{2} e^{-j2\omega_0 t} + 1 +$$

$$+ \frac{1}{2} e^{j2\omega_0 t} - \frac{j}{4} e^{j4\omega_0 t} =$$

$$= 1 + \frac{e^{j2\omega_0 t} + e^{-j2\omega_0 t}}{2} + \frac{1}{2} \frac{e^{j4\omega_0 t} - e^{-j4\omega_0 t}}{2j} =$$

$$= \boxed{1 + \cos(2\omega_0 t) + \frac{1}{2}\sin(4\omega_0 t)}$$

7. b) $$\boxed{P} = \sum_{k=-\infty}^{\infty} |X_k|^2 = \left(\frac{1}{4}\right)^2 + \left(\frac{1}{2}\right)^2 + 1^2 + \left(\frac{1}{2}\right)^2 + \left(\frac{1}{4}\right)^2 =$$

$$= \frac{1}{8} + \frac{1}{2} + 1 = \frac{1+4+8}{8} = \boxed{\frac{13}{8}}$$

c) Koristimo službeni šalabahter i svojstva:

$$\sin(\omega_0 t) \circ\!\!-\!\!\bullet\ -j\pi\left[\delta(\omega-\omega_0) - \delta(\omega+\omega_0)\right]$$

$$\cos(\omega_0 t) \circ\!\!-\!\!\bullet\ \pi\left[\delta(\omega-\omega_0) + \delta(\omega+\omega_0)\right]$$

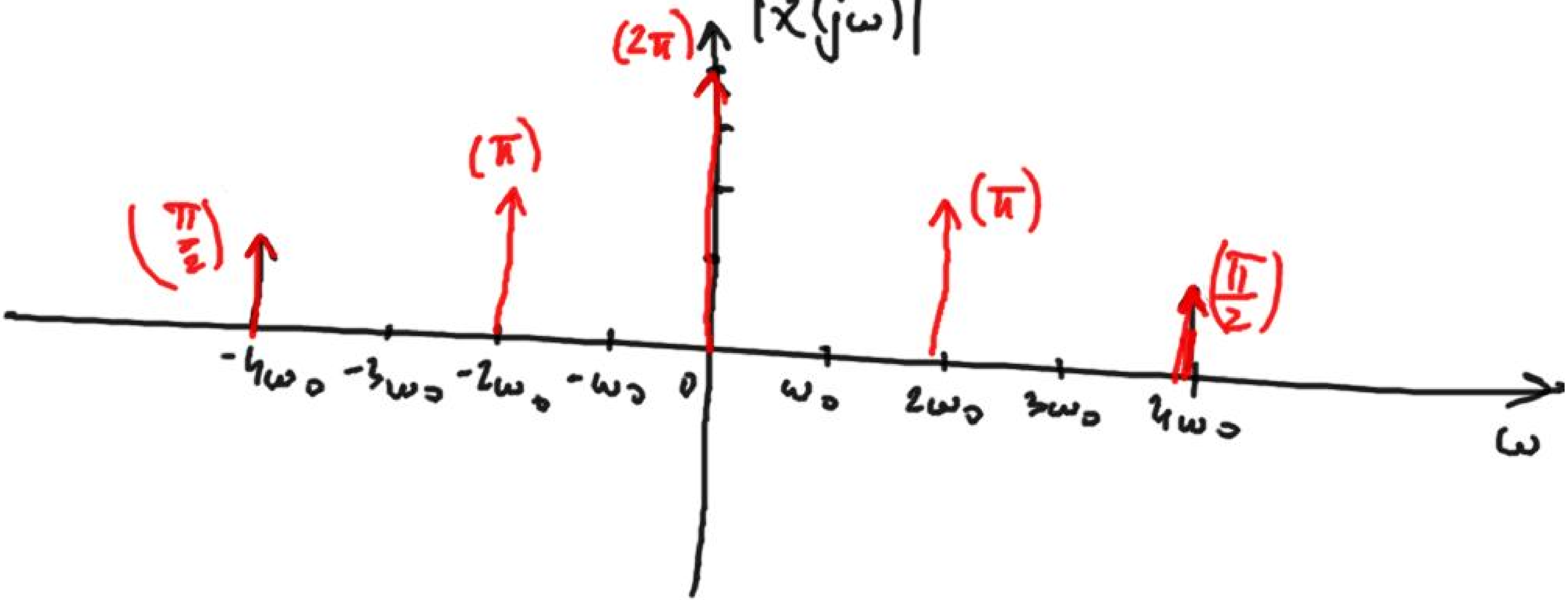
$$1 \circ\!\!-\!\!\bullet\ 2\pi\delta(\omega)$$

$$\boxed{X(j\omega) = 2\pi\delta(\omega) + \pi\left[\delta(\omega-2\omega_0) + \delta(\omega+2\omega_0)\right] - j\frac{\pi}{2}\left[\delta(\omega-4\omega_0) - \delta(\omega+4\omega_0)\right]}$$

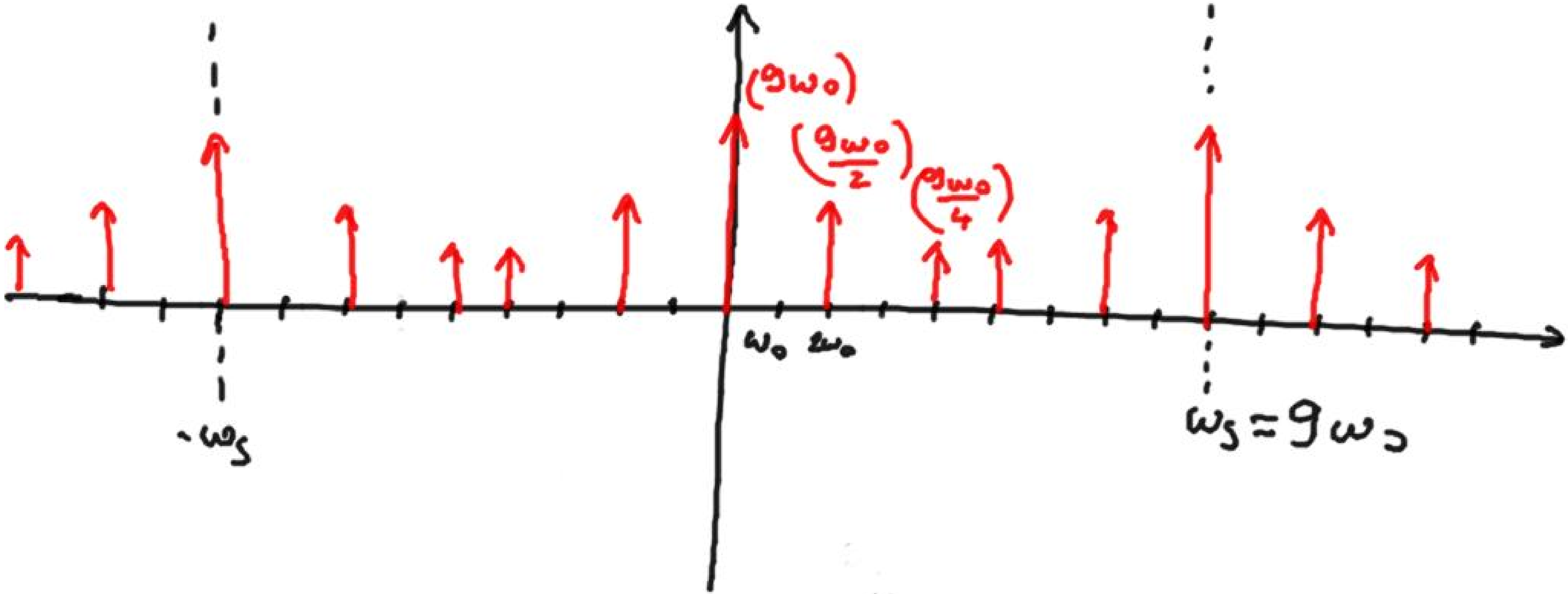
(I.) c) nastavak

$$|X(j\omega)| = \sqrt{\left[2\pi\delta(\omega) + \pi\delta(\omega - 2\omega_0) + \pi\delta(\omega + 2\omega_0)\right]^2 + \ldots}$$

$$\overline{\ldots + \left[-\frac{\pi}{2}\delta(\omega - 4\omega_0) + \frac{\pi}{2}\delta(\omega + 4\omega_0)\right]^2}$$



I. d) $\omega_s = 9\omega_0$ $\qquad |X_s(j\omega)| = \dfrac{|X(j\omega)|}{T_s} = \dfrac{|X(j\omega)|}{\frac{2\pi}{\omega_s}} = \dfrac{9\omega_0}{2\pi}|X(j\omega)|$



(8.) a) $x(n) = x(nT_s) = 1 + \cos\left(2\omega_0 \cdot n \cdot \frac{\pi}{8\omega_0}\right) +$

$+ \frac{1}{2}\sin\left(4\omega_0 \cdot n \frac{\pi}{8\omega_0}\right) =$

$= 1 + \cos\left(\frac{n\pi}{4}\right) + \frac{1}{2}\sin\left(\frac{n\pi}{2}\right)$

$N_1 = \frac{2k\pi}{\frac{\pi}{4}} = 8k = (k=1) = 8$

$N_2 = \frac{2k\pi}{\frac{\pi}{2}} = 4k = (k=1) = 4$

$N_0 = NZV(4,8) = 8$

$\Rightarrow$ signal je diskretan i periodičan! $\rightarrow$ DTFS

8. a) nastavak

$$N_0 = 8 \Rightarrow \omega_0 = \frac{2\pi}{N_0} = \frac{2\pi}{8} = \frac{\pi}{4}$$

$$\omega_1 = \omega_0$$

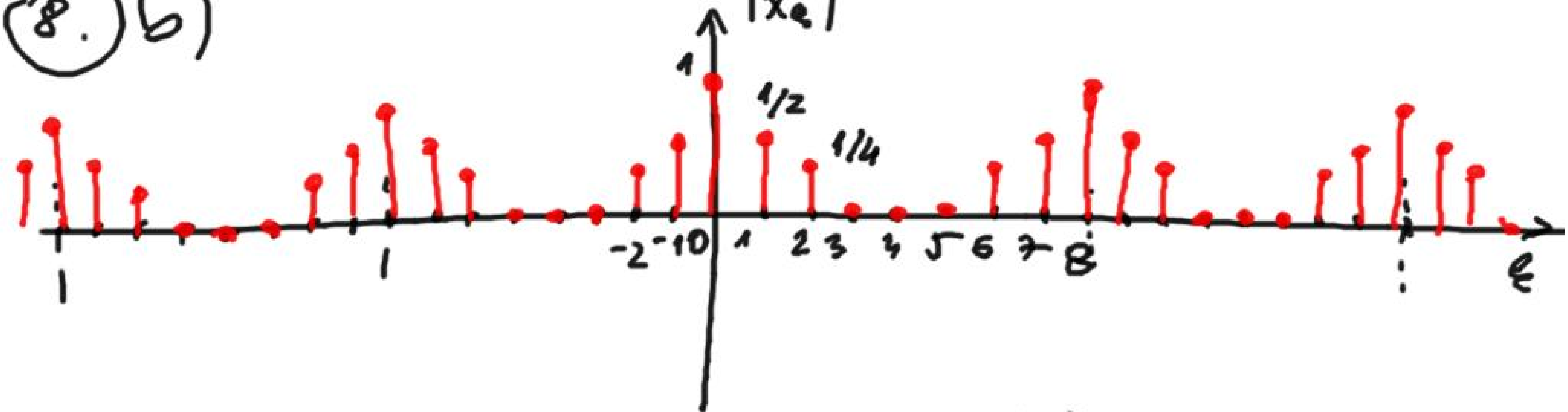
$$\omega_2 = 2\omega_0$$

$$x(n) = 1 + \cos(\omega_0 n) + \frac{1}{2}\sin(2\omega_0 n) = 1 + \frac{e^{j\omega_0 n} + e^{-j\omega_0 n}}{2} +$$

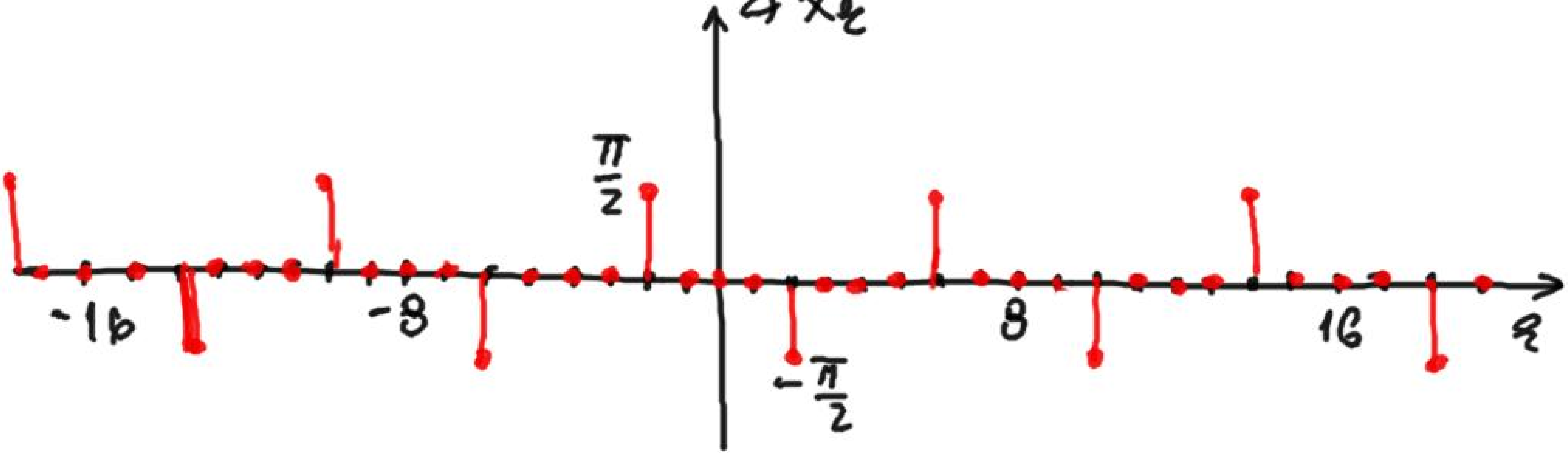
$$+ \frac{1}{2}\,\frac{e^{j2\omega_0 n} - e^{-j2\omega_0 n}}{2j}$$

$$\Rightarrow \boxed{\begin{aligned} X_0 &= 1 = 1e^{j0} \\ X_1 &= X_{-1} = \frac{1}{2} = \frac{1}{2}e^{j0} \\ X_2 &= \frac{1}{4j} = \frac{1}{4}(-j) = \frac{1}{4}e^{-j\frac{\pi}{2}} \\ X_{-2} &= -\frac{1}{4j} = \frac{1}{4}j = \frac{1}{4}e^{j\frac{\pi}{2}} \end{aligned}}$$

8. b)



Ne zaboraviti da je spektar periodičan s istim periodom kao i signal!!! To se vidi i na službenom šalabahteru.



8. a) $\boxed{P} = \sum_{k=0}^{N-1} |X_k|^2 = \sum_{k=0}^{7} |X_k|^2 =$

$= 1^2 + \left(\frac{1}{2}\right)^2 + \left(\frac{1}{4}\right)^2 + \left(\frac{1}{4}\right)^2 + \left(\frac{1}{2}\right)^2 =$

$= 1 + \frac{1}{2} + \frac{1}{8} = \boxed{\frac{13}{8}}$

d) signal je realan $\rightarrow X_k^* = X_{-k}$

$k = -2 \Rightarrow X_{-2}^* = X_{-(-2)} = X_2 \Rightarrow X_{-2}^* = \left(\frac{j}{4}\right)^* = -\frac{j}{4} = X_2$

$k = -1 \Rightarrow X_{-1}^* = X_{-(-1)} = X_1 \Rightarrow X_{-1}^* = \left(\frac{1}{2}\right)^* = \frac{1}{2} = X_1$

$k = 0 \Rightarrow X_0^* = X_0 \Rightarrow X_0^* = 1^* = 1 = X_0$

$k = 1 \Rightarrow X_1^* = X_{-1} \Rightarrow X_1^* = \left(\frac{1}{2}\right)^* = \frac{1}{2} = X_{-1}$

$k = 2 \Rightarrow X_2^* = X_{-2} \Rightarrow X_2^* = \left(-\frac{j}{4}\right)^* = \frac{j}{4} = X_{-2}$

9. a) $\omega_0 = 5\pi \Rightarrow x(t) = 1 + \cos(10\pi t) + \frac{1}{2}\sin(20\pi t)$

$$x(n) = x(nT_s) = 1 + \cos(10\pi \cdot nT_s) + \frac{1}{2}\sin(20\pi n T_s) =$$

$$= 1 + \cos\left(10n\pi \cdot \frac{2\pi}{\omega_s}\right) + \frac{1}{2}\sin\left(20n\pi \cdot \frac{2\pi}{\omega_s}\right) =$$

$$= 1 + \cos\left(10n\pi \cdot \frac{2\pi}{60\pi}\right) + \frac{1}{2}\sin\left(20n\pi \cdot \frac{2\pi}{60\pi}\right) =$$

$$= 1 + \cos\left(\frac{n\pi}{3}\right) + \frac{1}{2}\sin\left(\frac{2n\pi}{3}\right)$$

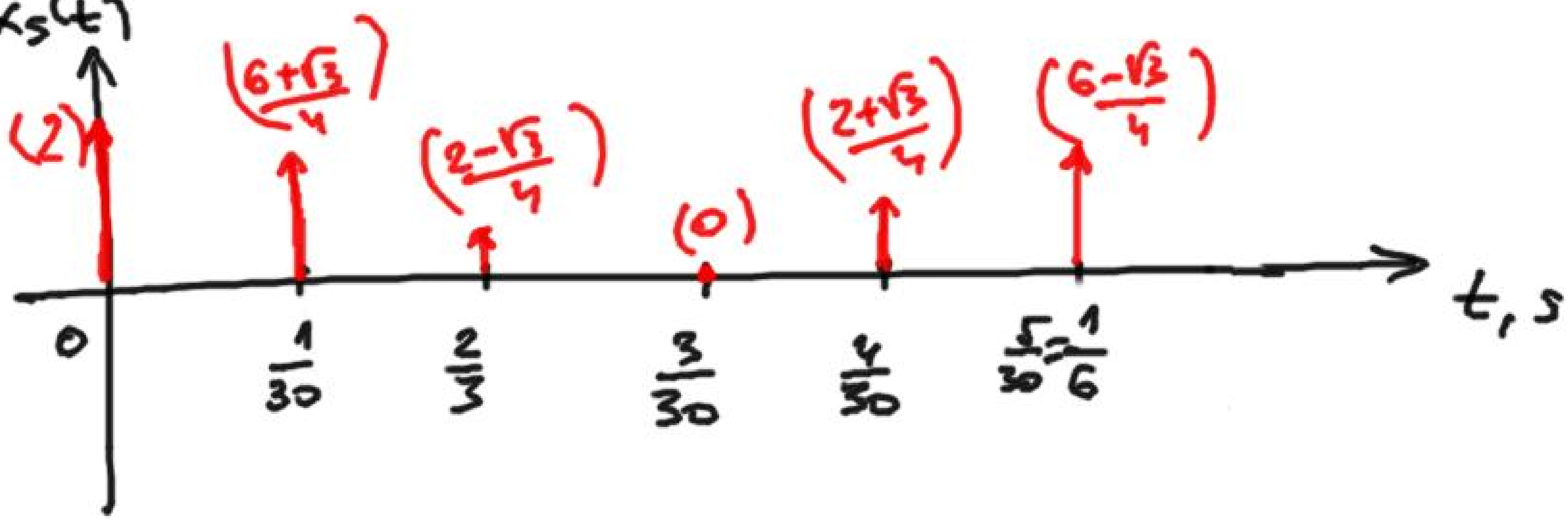
$\frac{1}{6}$ sek. snimljeno $\rightarrow$ period otipkavanja $T_s = \frac{2\pi}{\omega_s} = \frac{1}{30}$ sekundi

$\Rightarrow \frac{\frac{1}{6}}{\frac{1}{30}} = \frac{30}{6} = 5$ razmaka $\Rightarrow$ 6 očitaka

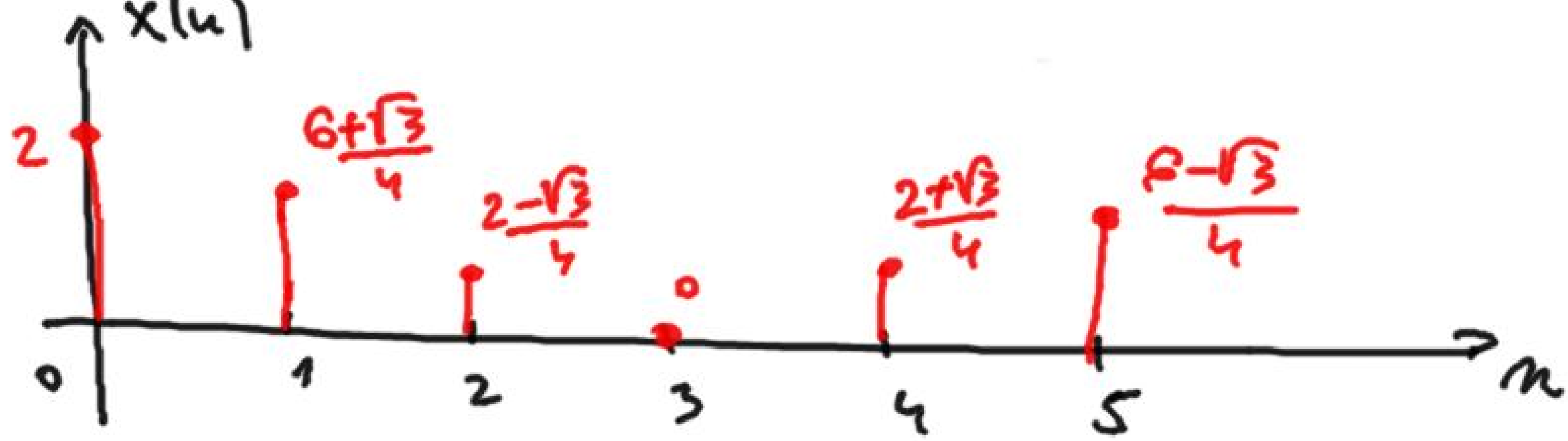
$x(0) = \ldots = 2$ $\quad x(2) = \frac{2-\sqrt{3}}{4}$ $\quad x(4) = \frac{2+\sqrt{3}}{4}$

$x(1) = \ldots = \frac{6+\sqrt{3}}{4}$ $\quad x(3) = 0$ $\quad x(5) = \frac{6-\sqrt{3}}{4}$

9. a) nastavak



xs(t)
(2)
(6+√3)/4
(2−√3)/4
(0)
(2+√3)/4
(6−√3)/4
t, s
0
1/30
2/3
3/30
4/30
5/30 = 1/6



x(n)
2
(6+√3)/4
(2−√3)/4
0
(2+√3)/4
(6−√3)/4
n
0
1
2
3
4
5

9. a) nastavak_2

$\boxed{\text{DFT}}$

$$X(k) = \sum_{n=0}^{N-1} x(n) e^{-\frac{2\pi j k n}{N}} =$$

$$= x(0) + x(1) e^{-\frac{2\pi j k}{6}} + x(2) e^{-\frac{2\pi j k \cdot 2}{6}} + x(3) e^{-\frac{2\pi j k \cdot 3}{6}} +$$

$$+ x(4) e^{-\frac{2\pi j k \cdot 4}{6}} + x(5) e^{-\frac{2\pi j k \cdot 5}{6}} =$$

$$= 2 + \frac{6+\sqrt{3}}{4} e^{-j\frac{k\pi}{3}} + \frac{2-\sqrt{3}}{4} e^{-j\frac{2k\pi}{3}} + \frac{2+\sqrt{3}}{4} e^{-j\frac{4k\pi}{3}} +$$

$$+ \frac{6-\sqrt{3}}{4} e^{-j\frac{5k\pi}{3}}$$ Ne da mi se računati :D

$X(1) = \ldots =$ $X(3) = \ldots$ $X(5) = \ldots$

$X(2) = \ldots =$ $X(4) = \ldots$

(9.) b) Uzorci su frekvencijski razmaknuti za $\frac{\omega_s}{N}$:

$$\frac{\omega_s}{N} = \frac{60\pi}{6} = 10\pi$$

Dakle: $X(0) \Rightarrow 0$ rad/s

$\boxed{X(1) \Rightarrow 10\pi \text{ rad/s}}$

$X(2) \Rightarrow 20\pi$ rad/s

$X(3) \Rightarrow 30\pi$ rad/s

$X(4) = 40\pi$ rad/s

$X(5) = 50\pi$ rad/s

ovo je za $\omega = 10\pi$ rad/s

↳ toj frekv. odgovara $\boxed{X(1) = \frac{6+\sqrt{3}}{4}}$

(9.) c) Očitano s $\omega_s = 60\pi$.

Broj razmaka = 5

$$\boxed{\omega_0} = \frac{\omega_s}{br.roz.} = \frac{60\pi}{5} = \boxed{12\pi \text{ rad/s}}$$

d) $\omega_0 = 2\pi$ rad/s

$\omega_s = 60\pi$ rad/s

$$br.razmaka = \frac{\omega_s}{\omega_0} = \frac{60\pi}{2\pi} = 30 \rightarrow N = 31$$

$$\boxed{T_p} = \frac{N}{f_s} = \frac{31}{\frac{\omega_s}{2\pi}} = \frac{31 \cdot 2\cancel{\pi}}{60\cancel{\pi}} = \boxed{1{,}0333\text{ s}}$$