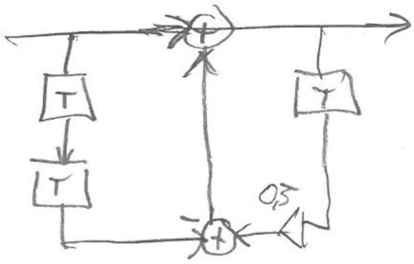
Linjära System 141031

1a) General and periodic sequences, respectively

b) Linear $a_1 x_1(n) + a_2 x_2(n) \rightarrow a_1 y_1(n) + a_2 y_2(n)$
Time-invariant $x(n-k) \rightarrow y(n-k)$

c) Stable system : unitcircle in ROC
Causal and stable : poles inside unit circle

d) $y(n) = y_s(n) + y_t(n)$ — transient $\rightarrow 0$ for stable syst.
y_s: stationary, same type as $x(n)$

e) $x(n)$  $y(n)$

2a) $$H(z) = \frac{2z^2 - 0{,}9z}{z^2 - 0{,}9z + 0{,}14} = \frac{2z(z-0{,}45)}{(z-0{,}7)(z-0{,}2)}$$

b) ROC : $|z| > 0{,}7$

c) zeros : 0 and 0,45
poles : 0,7 and 0,2 $\Rightarrow$ stable

d) $$H(z) = \frac{2 - 0{,}9z^{-1}}{1 - 0{,}9z^{-1} + 0{,}14z^{-2}}$$

$$\Longleftrightarrow y(n) - 0{,}9y(n-1) + 0{,}14y(n-2) = 2x(n) - 0{,}9x(n-1)$$

3a) $H(z) = (1+z^{-1})(1+2z^{-1}) = 1+3z^{-1}+2z^{-2}$

$$= \frac{z+1}{z} \cdot \frac{z+2}{z} = \frac{z^2+3z+2}{z^2}$$

zeros: $z=-1$, $z=-2$
poles: $z=0$ (double)

b) $H(z) = \frac{z}{z-0{,}5} \cdot \frac{z}{z-0{,}4}$ zeros $z=0$ (double) poles $z=0{,}5$, $z=0{,}4$

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4) $|H(e^{j\omega T})| = |a_1 + 2a_0 \cos(\omega T)|$

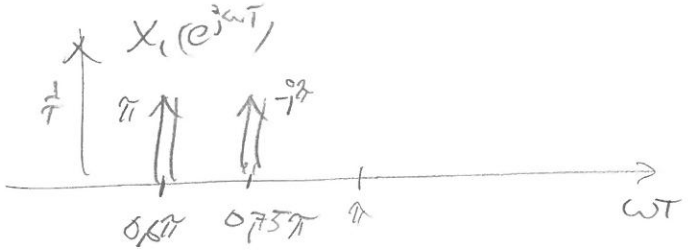
$$\begin{cases} a_1 + 2a_0\cos(\omega_0 T) = 0 & \omega_0 T = 0{,}23\pi \\ a_1 + 2a_0\cos(\omega_1 T) = 1{,}5 & \omega_1 T = 0{,}77\pi \end{cases}$$

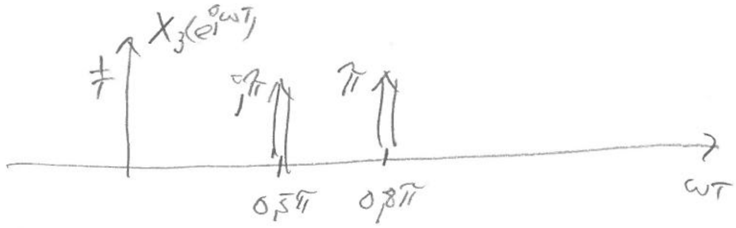
$$2a_0(\cos(\omega_1 T) - \cos(\omega_0 T)) = 1{,}5$$

$$\Rightarrow a_0 = \frac{1{,}5}{2\cdot(\quad)} \approx -0{,}5 \quad (\text{or } 0{,}5)$$

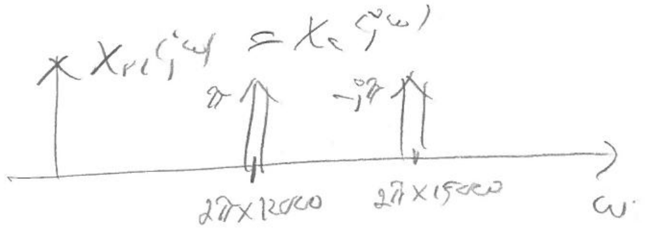
$$a_1 = 0{,}75 \quad (\text{or } -0{,}75)$$

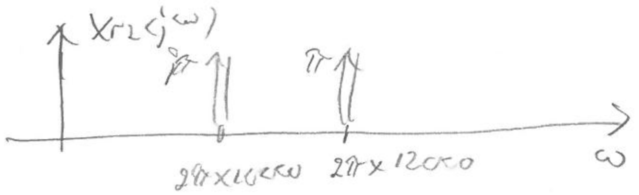
5a)

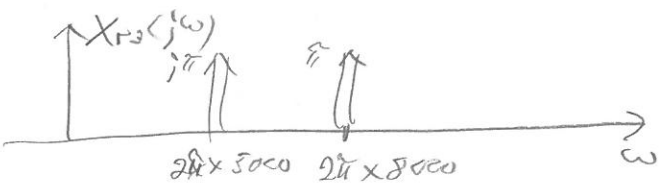




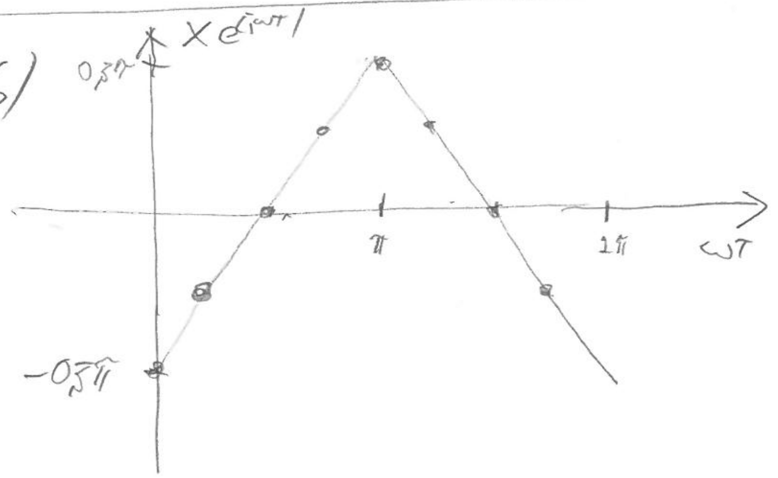
b)





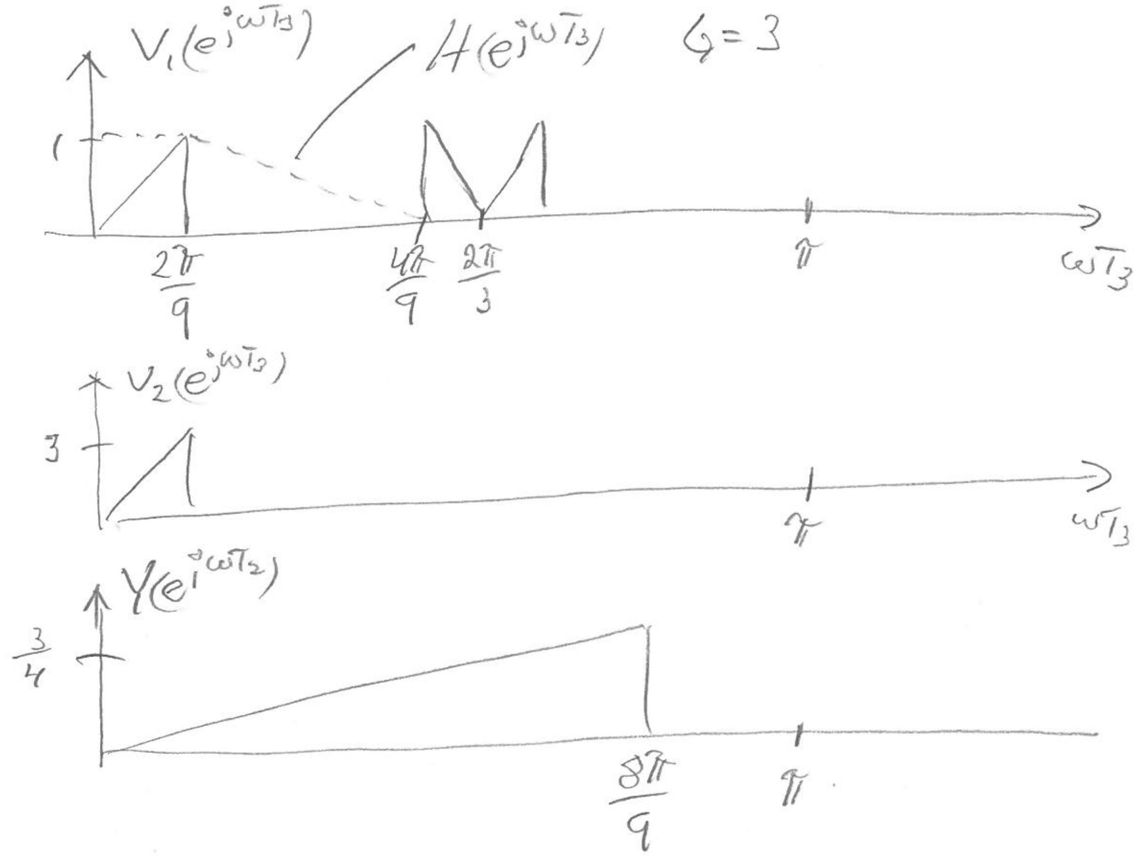


6)



k	$\lvert X_1(k)\rvert$	$\arg\{X_1(k)\}$
0	$0,5\pi$	$\pm\pi$
1	$0,25\pi$	$\pm\pi$
2	0	Undef.
3	$0,25\pi$	0
4	$0,5\pi$	0
5	$0,25\pi$	0
6	0	Undef.
7	$0,25\pi$	$\pm\pi$

7)


$V_1(e^{j\omega T_3})$
$H(e^{j\omega T_3})$
$q=3$
1
$\frac{2\pi}{9}$
$\frac{4\pi}{9}$
$\frac{2\pi}{3}$
π
ωT_3
$V_2(e^{j\omega T_3})$
3
π
ωT_3
$Y(e^{j\omega T_2})$
$\frac{3}{4}$
$\frac{8\pi}{9}$
π