

Opgave a

i) poles: $-2 \pm 2j$
nulpunkt: -1

overføringsfunktion: $K \frac{s+1}{(s+2+2j)(s+2-2j)}$

$s = j\omega$, set $\omega = 0$ for DC

$$H(0) = K \frac{0+1}{(0+2+2j)(0+2-2j)} = 7$$

$$= \frac{K}{4 - 4j + 4j + 4} = 7$$

$$\Rightarrow K = 7 \cdot 8 = 56$$

$$H(s) = \frac{56(s+1)}{(s+2+2j)(s+2-2j)}$$

ii) $H(s) = \frac{K}{(s+2)(s+3)}$

set $s = j\omega$ $\omega = 0$

$$H(0) = \frac{K}{(0+2)(0+3)} = 3 \Rightarrow K = 18$$

$$H(s) = \frac{18}{(s+2)(s+3)}$$

Opgave 2

iii)

$$H(s) = \frac{k}{(s+5-j)(s+5+j)(s+1-j)(s+1+j)(s+1)}$$

$$k = -3 \cdot (5-j)(s+j)(1-j)(s+j)(1)$$

iv)

$$H(s) = \frac{k(s+1)(s-2)}{(s+2)(s+5)}$$

$$k = \frac{2 \cdot 2 \cdot 5}{1 \cdot (-2)} = -10$$

v)

$$H(s) = \frac{k(s+1)}{(s+5-j)(s+5+j)}$$

$$k = \frac{1 \cdot (5-j)(5+j)}{1} = 26$$

vi)

$$H(s) = \frac{k}{(s+1)(s+2)s}$$

$$\lim_{s \rightarrow 0} s \frac{k}{(s+1)(s+2)s} = 7 \quad k = 14$$

Opgave a

ii)

$$H(s) = \frac{k(s+5)(s-2)}{(s+2-2j)(s+2+2j)s}$$

$$\lim_{s \rightarrow 0} s \frac{k(s+5)(s-2)}{(s+2-2j)(s+2+2j)s} = 2$$

$$k = \frac{2 \cdot (2-2j)(2+2j)}{5 \cdot (-2)}$$

iii)

kan ikke løses. DC-svar vil være en rampefunktion, når der er en pol i $s=0$.

Opgave b Hint

et stepsvar er $\mathcal{L}^{-1}\left\{\frac{1}{s} \cdot H(s)\right\}$

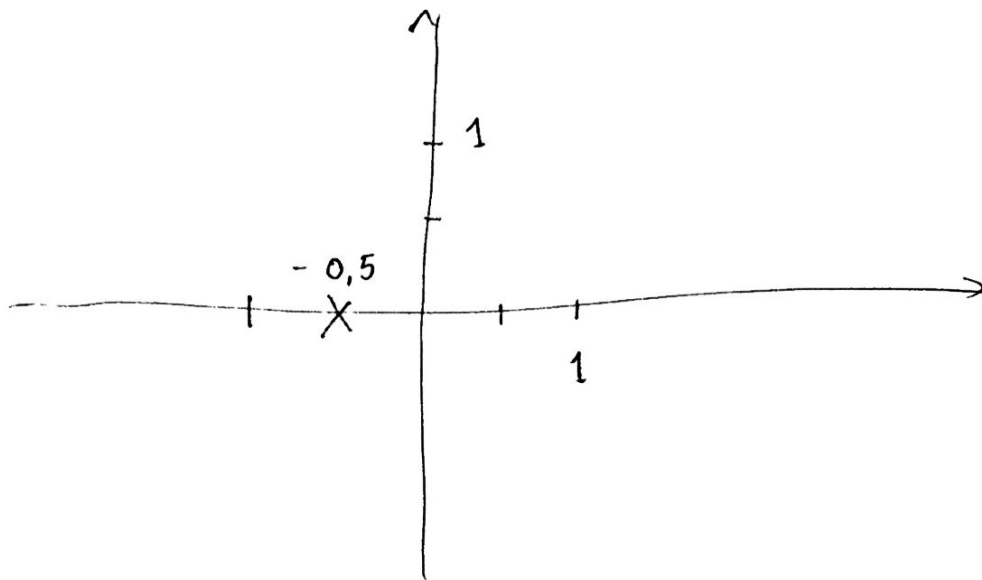
hvor $\frac{1}{s}$ er et step, og $H(s)$ en

overføringsfunktionen Find den invers

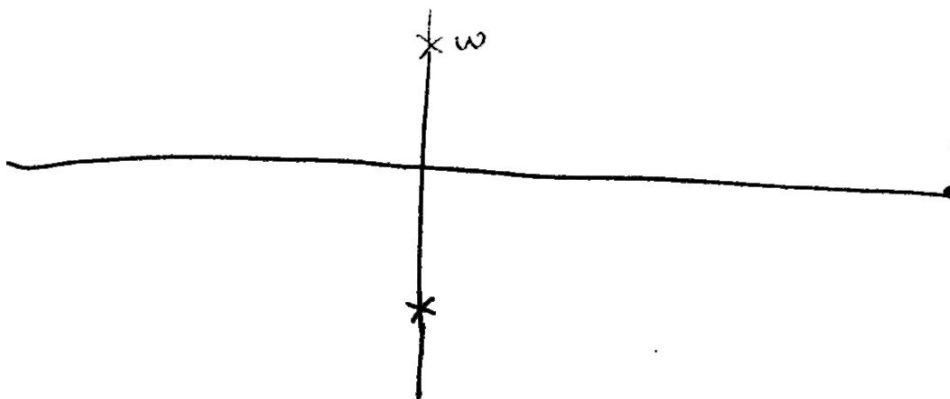
Laplace transformerede med f.eks. mathcad.

Opgave c

i) skitse over pol-nulpunktsdiagram



ii) skitse over pol-nulpunktsdiagram

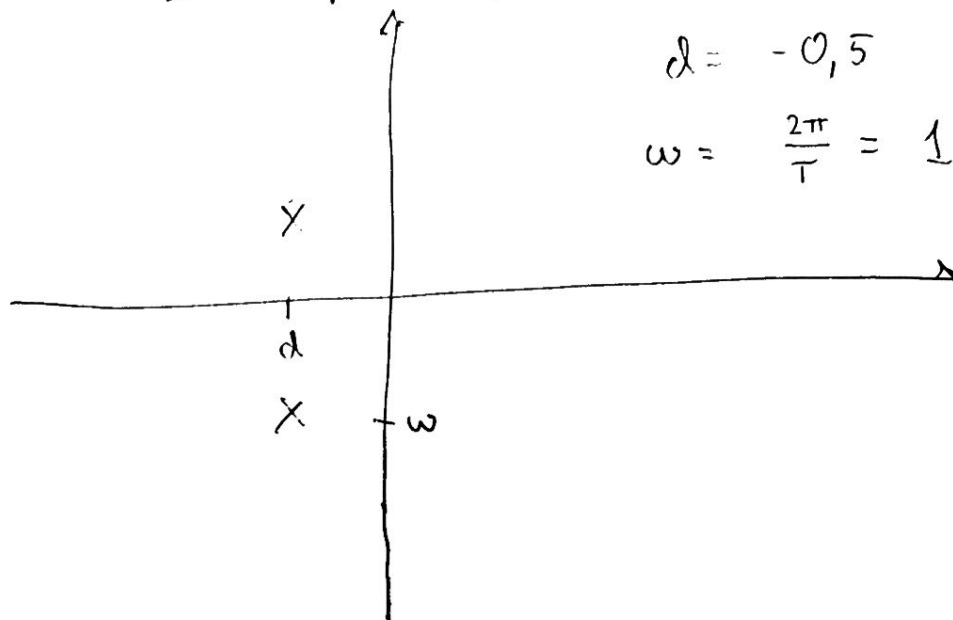


periode T altså $\Delta t = 2\pi$ $\omega = \frac{2\pi}{2\pi} = 1$

opgave c

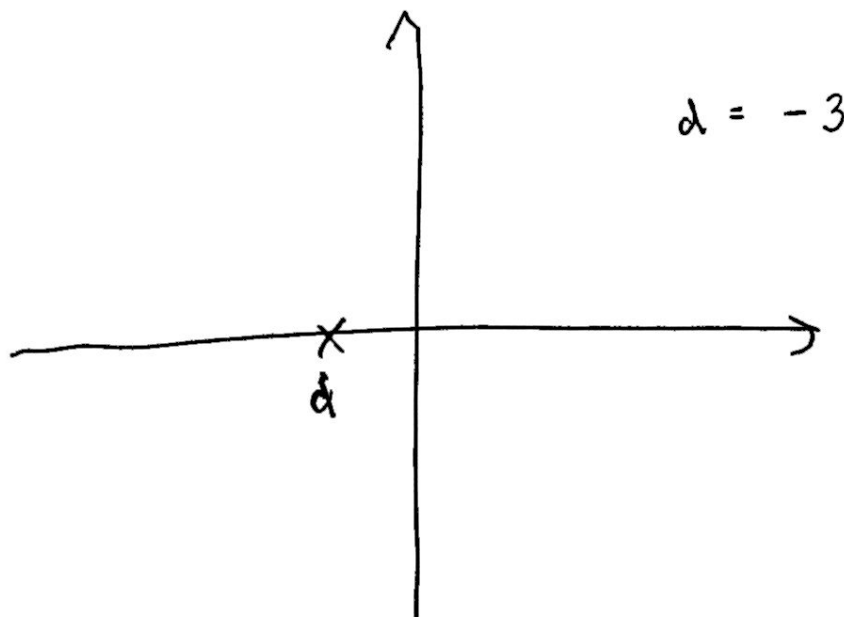
iii)

skitse pol-nulpunktdiagram



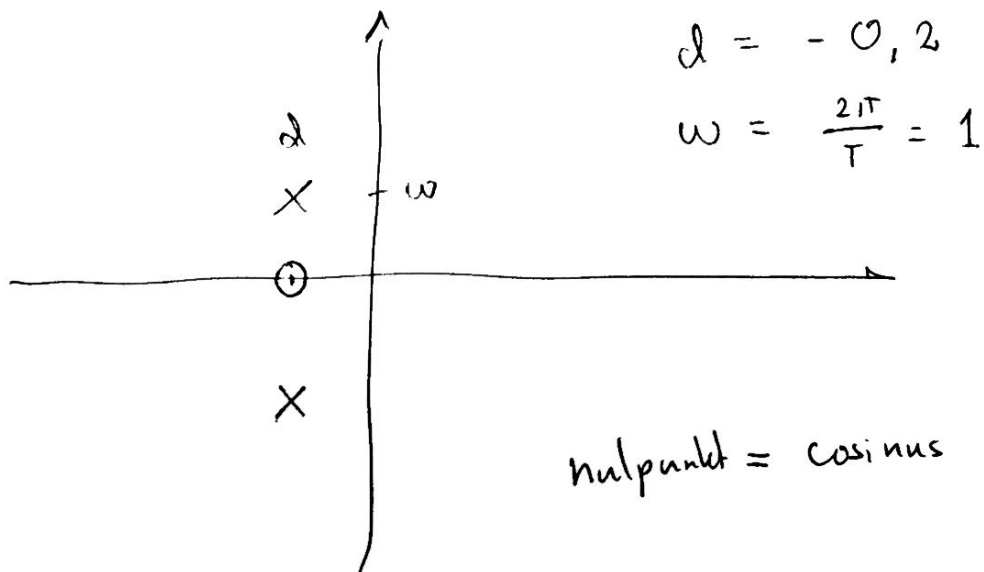
iv)

skitse over pol-nulpunktdiagram

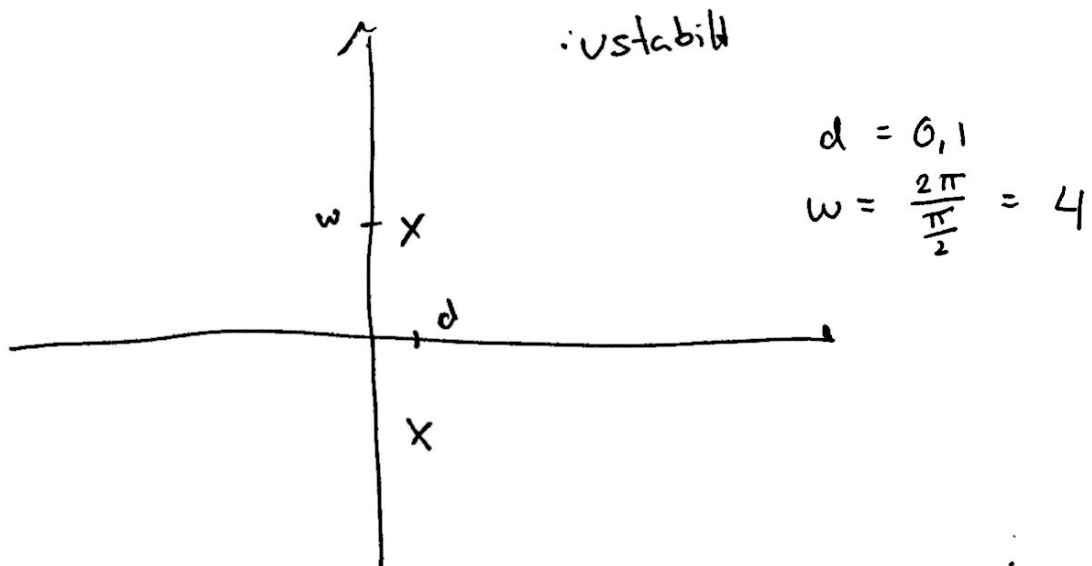


opgave C

v) skitse over pol-nulpunkt diagram



vi)



v)

