Opgave A

Fra opg. 10 har vi fourierkoeffcienterne a_n og b_n. Vi har en grundfrekvens $\omega = \frac{2\pi}{T} = \pi$.

$$a_n = (-1)^n \left(\frac{1}{\frac{\pi}{4} - \pi n^2} \right) \qquad b_n = 0$$

$a_1 = 0{,}42 \qquad a_2 = -0{,}085$

$a_3 = 0{,}036 \qquad a_4 = -0{,}020$

$a_5 = 0{,}013$

Amplitudespektrum:

$$A_1 = \sqrt{a_1^2 + b_1^2} = \sqrt{0{,}42^2 + 0^2} = 0{,}42$$

$$A_2 = \sqrt{a_2^2 + b_2^2} = \sqrt{(-0{,}085)^2 + 0^2} = 0{,}085$$

$$A_3 = \sqrt{0{,}036^2 + 0^2} = 0{,}036$$

$$A_4 = \sqrt{(-0{,}020)^2 + 0^2} = 0{,}020$$

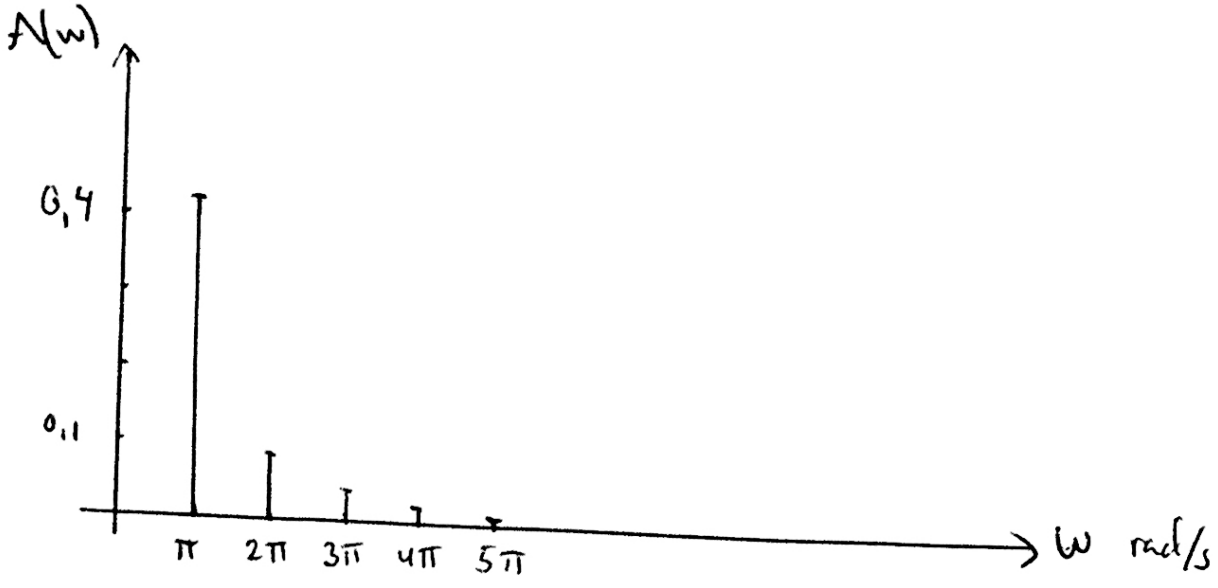
$$A_5 = \sqrt{0{,}013^2 + 0^2} = 0{,}013$$

Fasespektrum:

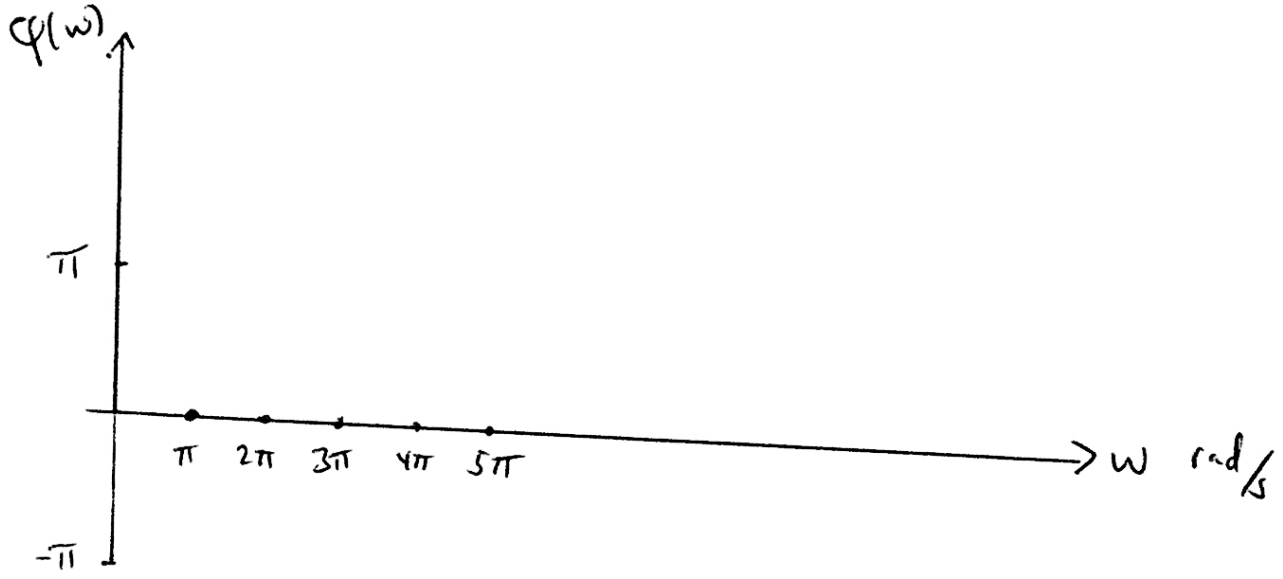
$$\varphi_1 = \operatorname{atan2}(b_1, a_1) = \operatorname{atan2}(0, 0{,}42) = 0$$

$\varphi_2 = 0 \qquad \varphi_3 = 0 \qquad \varphi_4 = 0 \qquad \varphi_5 = 0$

Amplitudespektrum opgave A



Fasespektrum



Opgave B

Fra opg 10 har vi:

$\omega = \frac{2\pi}{2} = \pi$ rad/s $\quad a_n = 0 \quad b_n = -\frac{2}{\pi n}$ n - ulige

$a_1 = 0 \quad b_1 = -0,64$

$a_2 = 0 \quad b_2 = 0$

$a_3 = 0 \quad b_3 = -0,21$

$a_4 = 0 \quad b_4 = 0$

$a_5 = 0 \quad b_5 = -0,13$

Amplituder:

$A_1 = \sqrt{a_1^2 + b_1^2} = \sqrt{0^2 + (-0,64)^2} = 0,64$

$A_2 = 0$

$A_3 = \sqrt{0^2 + (0,21)^2} = 0,21$

$A_4 = 0$

$A_5 = 0,13$

Faser:

$\varphi_1 = \text{atan2}(b_1 ; a_1) = \text{atan2}(-0,64, 0) = -\frac{\pi}{2}$ rad $= -90°$

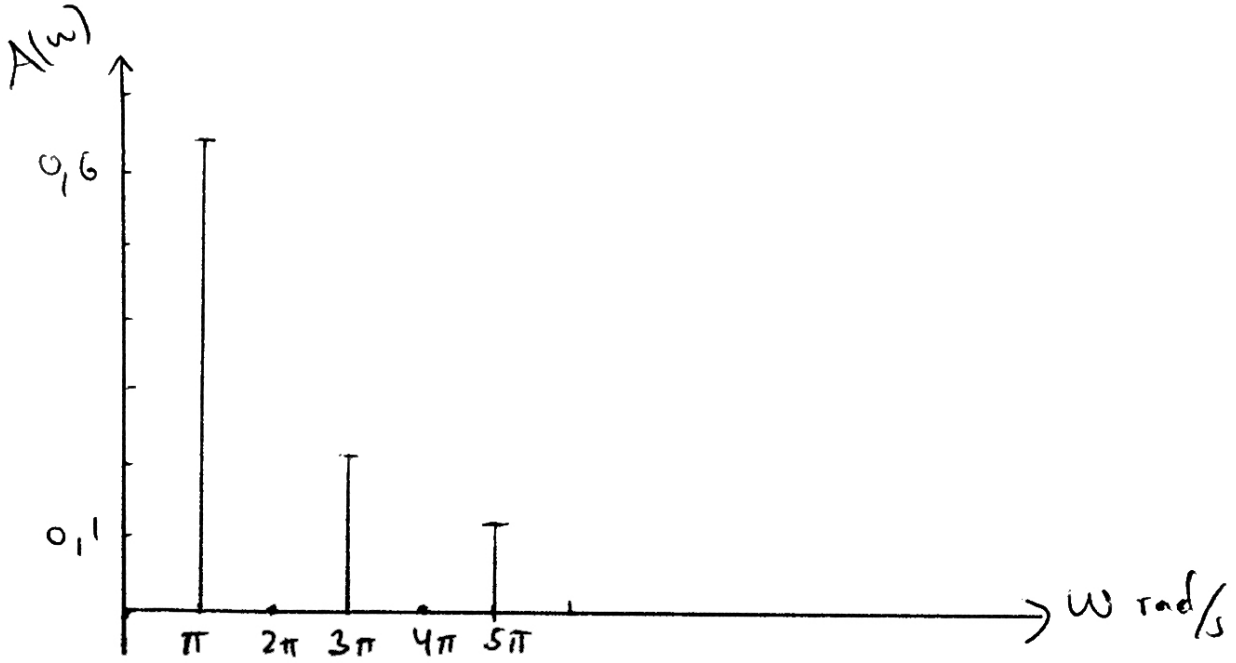
$\varphi_2 = 0$

φ_3 atan $(-0,21, 0) = -\frac{\pi}{2}$ rad $= -90°$

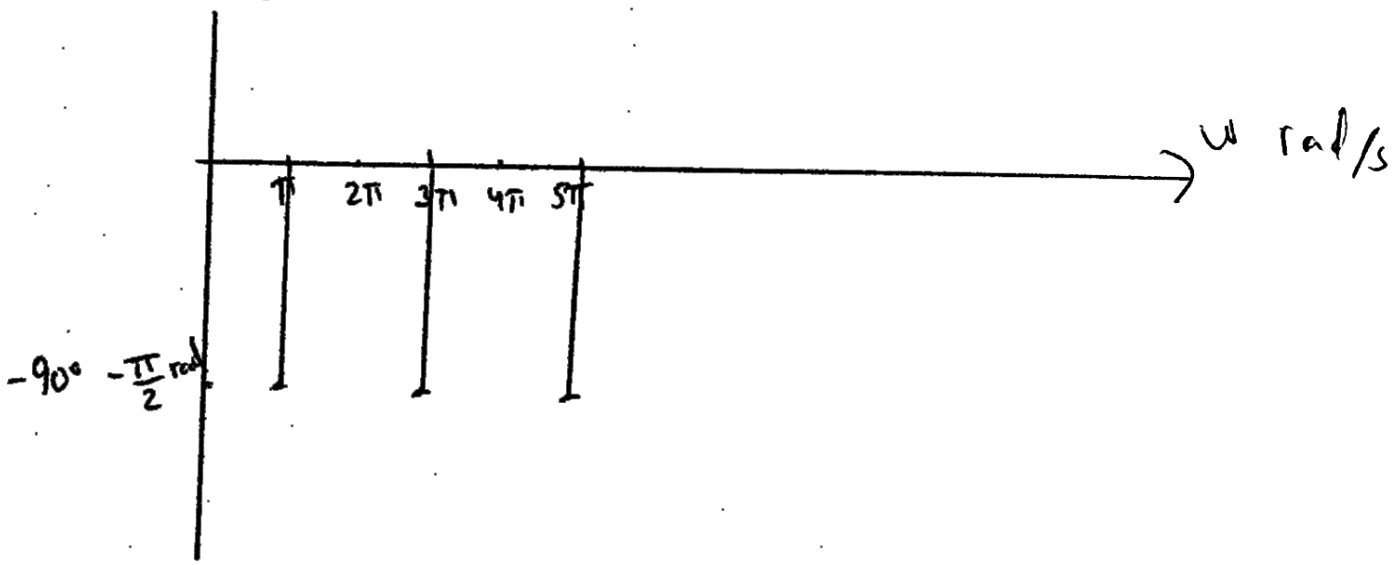
$\varphi_4 = 0$

$\varphi_5 = -\frac{\pi}{2}$ rad $= -90°$

Amplitude plot opgave B



Faseplot



opgave C

Fra opgave 10 har vi $\omega = \frac{2\pi}{T} = 1,57 \text{ rad/s}$

$a_n = \frac{4}{\pi^2 n^2}$ $\quad b_n = 0$

$a_1 = 0,41$ $\quad b_1 = 0$

$a_2 = 0,10$ $\quad b_2 = 0$

$a_3 = 0,045$ $\quad b_3 = 0$

$a_4 = 0,025$ $\quad b_4 = 0$

$a_5 = 0,016$ $\quad b_5 = 0$

Amplituder

$A_1 = \sqrt{a_1^2 + b_1^2} = 0,41$

$A_2 = 0,10$

$A_3 = 0,045$

$A_4 = 0,025$

$A_5 = 0,016$

Faser

$\varphi_1 = \text{atan2}(0, 0,41) = 0$

$\varphi_2 = 0$

$\varphi_3 = 0$

$\varphi_4 = 0$

$\varphi_5 = 0$

opgave D

periodetiden $T = 3,49$ $\quad \omega = \frac{2\pi}{T} = 1,8$ rad/s

$a_1 = 0,217$ $\quad b_1 = 0,45$

$a_2 = -0,13$ $\quad b_2 = 0,166$

$a_3 = 0$ $\quad b_3 = 0$

$a_4 = 0,0096$ $\quad b_4 = 0,0413$

$a_5 = 0$ $\quad b_5 = 0$

Amplituder

$A_1 = \sqrt{a_1^2 + b_1^2} = \sqrt{0,217^2 + 0,45^2} = 0,50$

$A_2 = \sqrt{(-0,13)^2 + 0,166^2} = 0,21$

$A_3 = \sqrt{0^2 + 0^2} = 0$

$A_4 = \sqrt{0,0096^2 + 0,0413^2} = 0,042$

$A_5 = \sqrt{0^2 + 0^2} = 0$

Faser

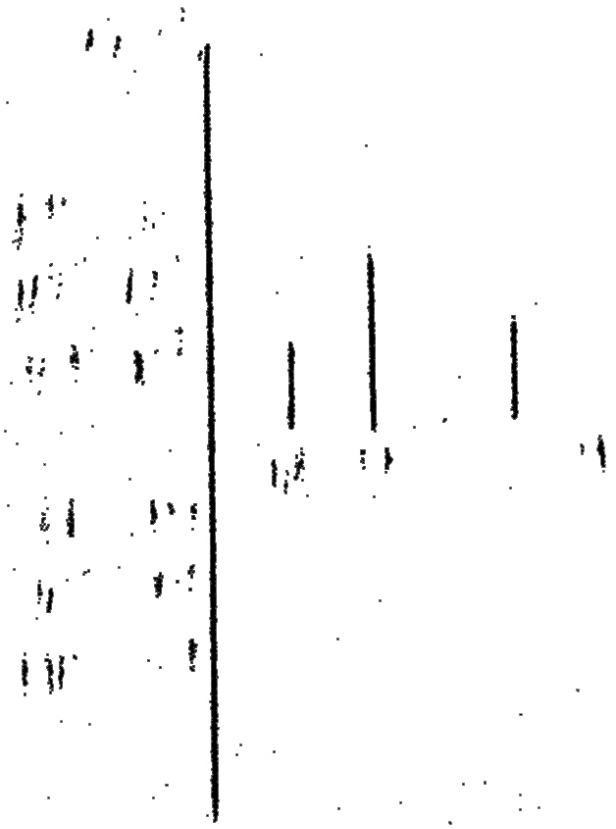
$\varphi_1 = \text{atan2}(b_1, a_1) = \text{atan2}(0,45, 0,217) = 1,12$ rad $= 64°$

$\varphi_2 = \text{atan2}(0,166, -0,13) = 2,24$ rad $= 128°$

$\varphi_3 = 0$

$\varphi_4 = \text{atan2}(0.0413, 0,0096) = 76,9° = 1,34$ rad

$\varphi_5 = 0$



Opgave D amplitudespektrum