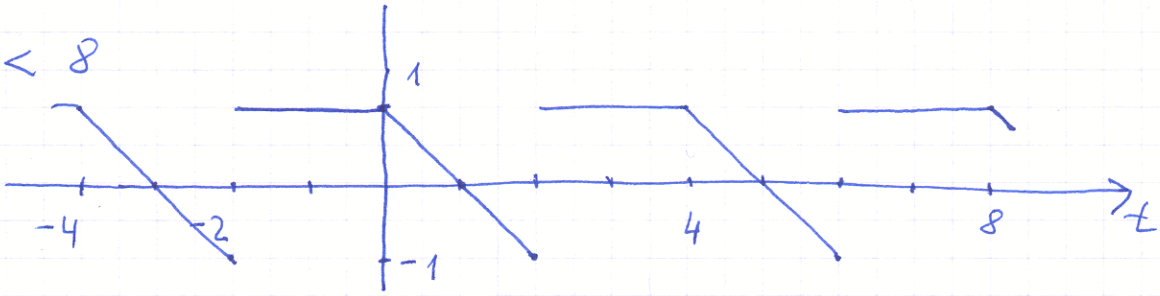
Opgave 1 : Løsningsforslag I2SIG1/maj01/DP

$T = 4$

$$f(t) = \begin{cases} 1 & \text{for } -\frac{T}{2} < t < 0 \\ 1-t & \text{for } 0 < t < \frac{T}{2} \end{cases}$$

a) $-4 < t < 8$



b) funktione er hverken lige eller ulige, fordi

$$f(-t) \neq \pm f(t) \qquad f(-1) = 1 \qquad f(1) = 0 \Rightarrow f(-1) \neq f(1)$$

$$\omega_1 = \frac{2\pi}{T} = \frac{2\pi}{4} = \frac{\pi}{2}$$

c) $$a_0 = \frac{2}{T}\left(\int_{-2}^{0} 1\,dt + \int_{0}^{2}(1-t)\,dt\right) = \frac{1}{2}\left(t\Big|_{-2}^{0} + \Big|t - \frac{1}{2}t^2\Big|_0^2\right)$$

$$a_0 = \frac{1}{2}(2 + 2 - 2) = \underline{\underline{1}}$$

d) $$a_n = \frac{2}{4}\left(\int_{-2}^{0} 1 \cdot \cos\left(\frac{\pi}{2}nt\right)dt + \int_{0}^{2}(1-t)\cos\left(\frac{\pi}{2}nt\right)dt\right)$$

$$b_n = \frac{2}{4}\left(\int_{-2}^{0} 1 \cdot \sin\left(\frac{\pi}{2}nt\right)dt + \int_{0}^{2}(1-t)\sin\left(\frac{\pi}{2}nt\right)dt\right)$$

$$a_n = \begin{cases} \frac{4}{n^2\pi^2} & \text{for } n \text{ ulige} \\ 0 & \text{for } n \text{ lige} \end{cases} \qquad b_n = \frac{2}{n\pi}(-1)^n$$

e) $$f(t) \simeq \frac{1}{2} + \frac{4}{\pi^2}\cos\frac{\pi}{2}t - \frac{2}{\pi}\sin\frac{\pi}{2}t + \frac{1}{\pi}\sin\pi t + \frac{4}{9\pi^2}\cos\frac{3\pi}{2}t - \frac{2}{3\pi}\sin\frac{3\pi}{2}t$$

f) t Collect $(4/\pi \wedge 2 * \cos(\pi/2\, t) - 2/\pi \sin(\pi/2\, t)) = \frac{2\sqrt{\pi^2+4}}{\pi^2}\cos\left(\frac{\pi}{2}t + 1{,}004\right)$

t Collect $(4/(9\pi \wedge 2) * \cos(3\pi/2\, t) - 2/(3*\pi)\sin(3\pi/2\, t)) = \frac{2\sqrt{9\pi^2+4}}{9\pi^2}\cos\left(\frac{3\pi}{2}t + 1{,}362\right)$

$$\underline{\underline{f(t) \simeq \frac{1}{2} + \frac{2\sqrt{\pi^2+4}}{\pi^2}\cos\left(\frac{\pi}{2}t + 1{,}004\right) + \frac{1}{\pi}\cos\left(\pi t - \frac{\pi}{2}\right) + \frac{2\sqrt{9\pi^2+4}}{9\pi^2}\cos\left(\frac{3\pi}{2}t + 1{,}362\right)}}$$