

with(DynamicSystems) :

Formlen for cutoff frekvens:

$$f_c = \frac{1}{2 \cdot \pi \cdot \sqrt{C1 \cdot C2 \cdot R1 \cdot R2}} = \frac{1}{2 \cdot \pi \cdot \sqrt{C1 \cdot C2 \cdot R^2}}$$

$$f_c = \frac{1}{2 \pi \sqrt{R1 \cdot C1 \cdot R2 \cdot C2}} \quad (1)$$

Bestemmer R1 og R2 :

$$\text{solve}\left(50 = \frac{1}{2 \cdot \pi \cdot \sqrt{10^{-6} \cdot (680 \cdot 10^{-9}) \cdot R^2}}, R\right)$$

$$\frac{50000}{17} \frac{\sqrt{17}}{\pi}, -\frac{50000}{17} \frac{\sqrt{17}}{\pi} \quad (2)$$

$$\frac{50000}{17} \frac{\sqrt{17}}{\pi} \xrightarrow{\text{at 5 digits}} 3860.0$$

$$3860 \approx 3900 = 3,9 \text{ k}\Omega$$

Overføringsfunktionen :

$$Tv(s) = \frac{\frac{1}{R1 \cdot C1 \cdot R2 \cdot C2}}{s^2 + s \cdot \left( \frac{1}{R2 \cdot C1} + \frac{1}{R1 \cdot C1} \right) + \frac{1}{R1 \cdot C1 \cdot R2 \cdot C2}}$$

$$\frac{V_{out}(s)}{V_{in}(s)} = \frac{1}{R1 \cdot C1 \cdot R2 \cdot C2 \left( s^2 + s \left( \frac{1}{R2 \cdot C1} + \frac{1}{R1 \cdot C1} \right) + \frac{1}{R1 \cdot C1 \cdot R2 \cdot C2} \right)} \quad (3)$$

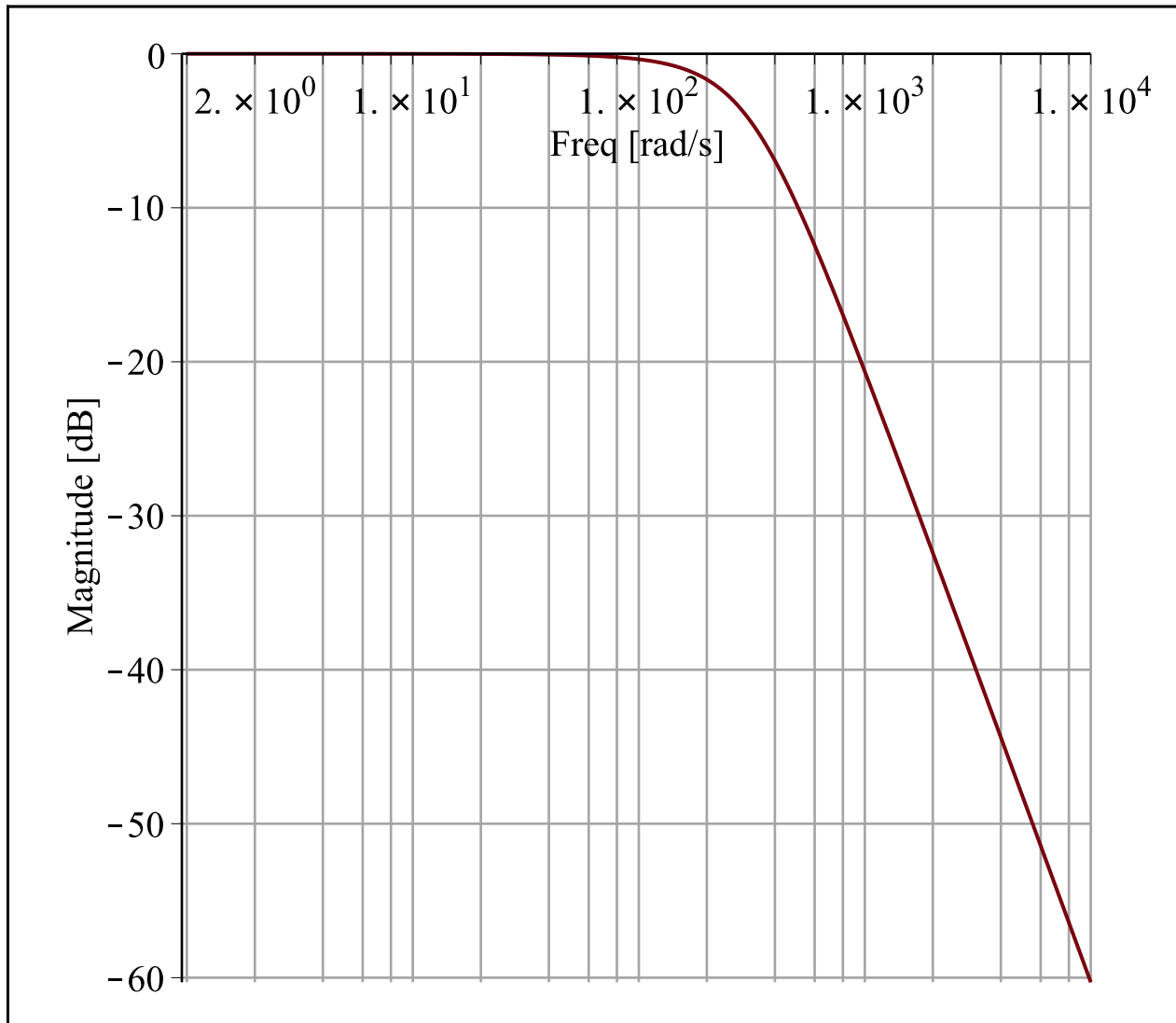
$$Tv(s) = \frac{1}{(3900 \cdot (1 \cdot 10^{-6}) \cdot 3900 \cdot (680 \cdot 10^{-9})) \left( s^2 + \left( s \cdot \left( \frac{1}{3900 \cdot (1 \cdot 10^{-6})} + \frac{1}{3900 \cdot (1 \cdot 10^{-6})} \right) + \frac{1}{3900 \cdot (1 \cdot 10^{-6}) \cdot 3900 \cdot (680 \cdot 10^{-9})} \right) \right)}$$

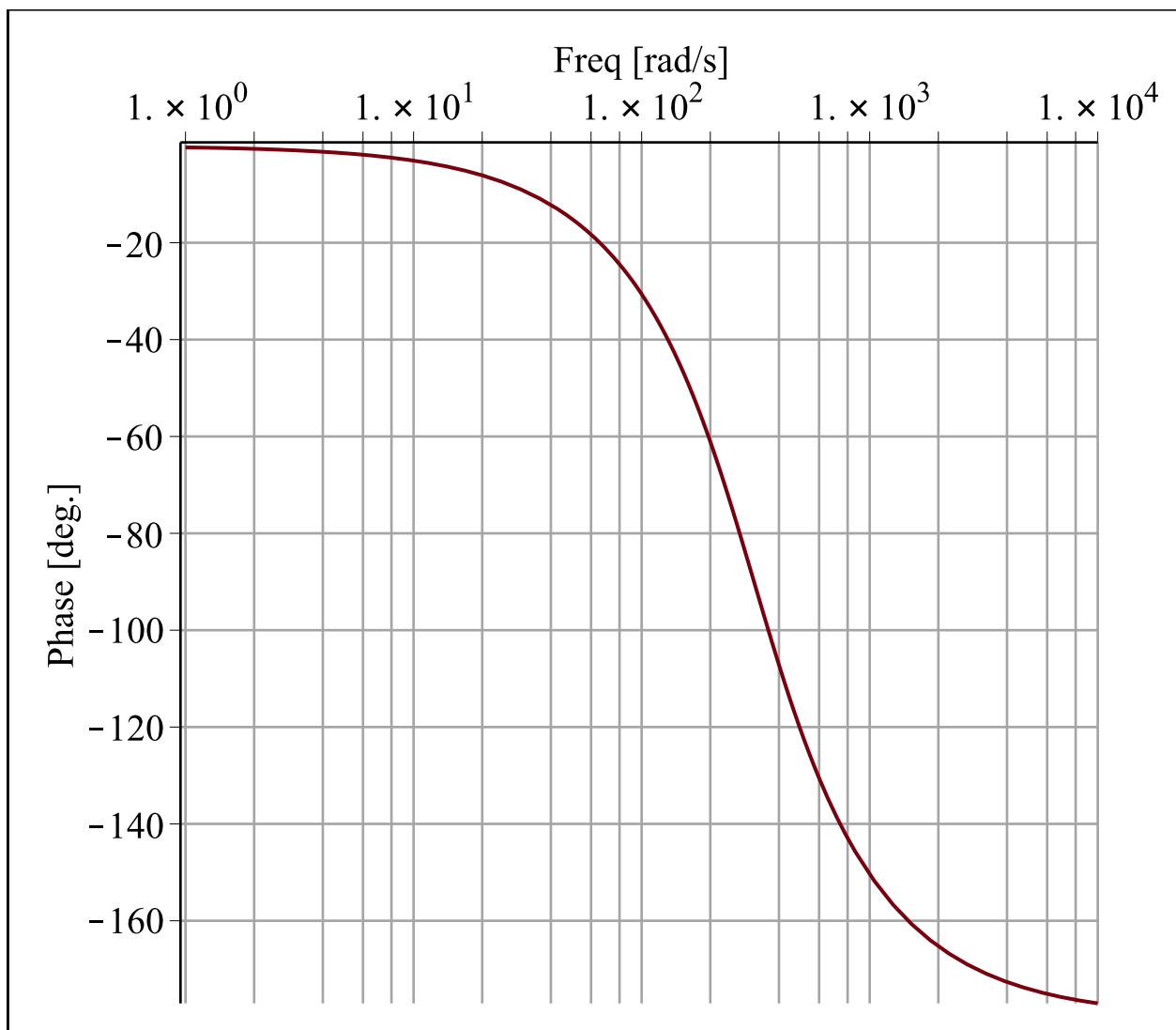
$$Tv(s) = \frac{1}{\frac{25857}{2500000000} s^2 + \frac{663}{125000} s + 1} \quad (4)$$

$$\frac{1}{\frac{25857}{2500000000} s^2 + \frac{663}{125000} s + 1} = \frac{96685.6170476}{s^2 + 512.820512821 \cdot s + 96685.6170476} \xrightarrow{\text{test relation}} \text{true}$$

$sys := \text{TransferFunction}\left(\frac{96685.6170476}{s^2 + 512.82 \cdot s + 96685.6170476}\right) :$

$\text{BodePlot}(sys)$





Heraf bekræftes det, at det er et lavpas filter.

Aflæser cutoff frekvens ved -3 dB til 269 rad/s  $\approx$  42,81Hz

Beregner cutoff frekvens:

$$\frac{1}{2 \cdot \pi \cdot \sqrt{10^{-6} \cdot (680 \cdot 10^{-9}) \cdot 3900 \cdot 3900}}$$

$$\xrightarrow{\text{at 5 digits}} \frac{25000}{663} \frac{\sqrt{17}}{\pi}$$

$$49.487$$

Det er så 49,48 Hz

Omregnes dette til  $\frac{\text{rad}}{\text{s}}$  er dette 310,89  $\frac{\text{rad}}{\text{s}}$ .

(6)