Exercise 1

plot a damped oscillation like Abb. (1).

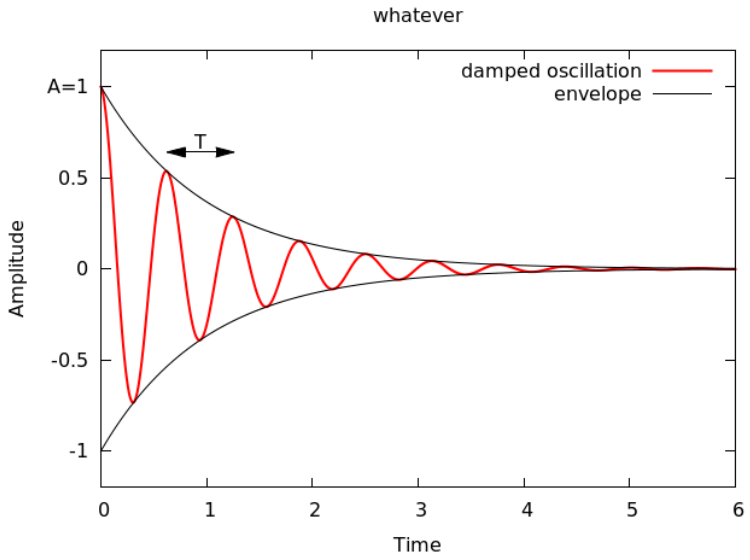

Abbildung 1: damped oscillation $A(x) = e^{-x} \cdot \cos(10x)$ with its envelope $\pm e^{-x}$.

what u could need

- set {x|y}range [*float*:*float*]
- set samples *number*; number of points wich get connected with straight lines.
- set label '*label*' at *position* (rotate by *degree*) (*alignement*)
- set arrow from *position* to *position* (filled) (heads)
- positions:
  - *float*,*float*: (x,y) value in the coordinate system
  - graph *float*,*float*: fraction of the axis length
- set title '*title*'
- set {x|y}label '*label*'
- set {x|y}tics (*distance* | ('*pos.*'*val.*,'*pos.*'*val.*,. . .)) (add ('*label*'*position*)) (format '*format*')
- tics format examples
  - %.3f floats with 3 digits after the dot
  - %L power to the base of the current logscale
  - %P multiple of π
  - %g integer
- Plotting styles like: plot sin(x) lc rgb 'green' lw 3 t 'test'
  - linetype *number*; short lt
  - linecolor rgb '*blue*'; short lc
  - linewidth *factor*; short lw;
  - title '*title*' | notitle

Exercise 2

make a Bode plot of a Low-pass filter like Abb. (2). The functions are:

$$\begin{aligned} \text{gain} &= 20 \cdot \log_{10} \frac{1}{\sqrt{1 + (f \cdot 2\pi \cdot RC)^2}} \\ \phi &= \arctan \frac{1}{(f \cdot 2\pi \cdot RC)^2} \end{aligned}$$

use $RC = 0.1\,\text{s}$ and the tikz terminal. Here is the code for a minimal LaTeX implenentation:

```
\documentclass[a4paper,9pt]{scrartcl}
\usepackage{gnuplot-lua-tikz}
\begin{document}
\input{tikz_terminal}
\end{document}
```

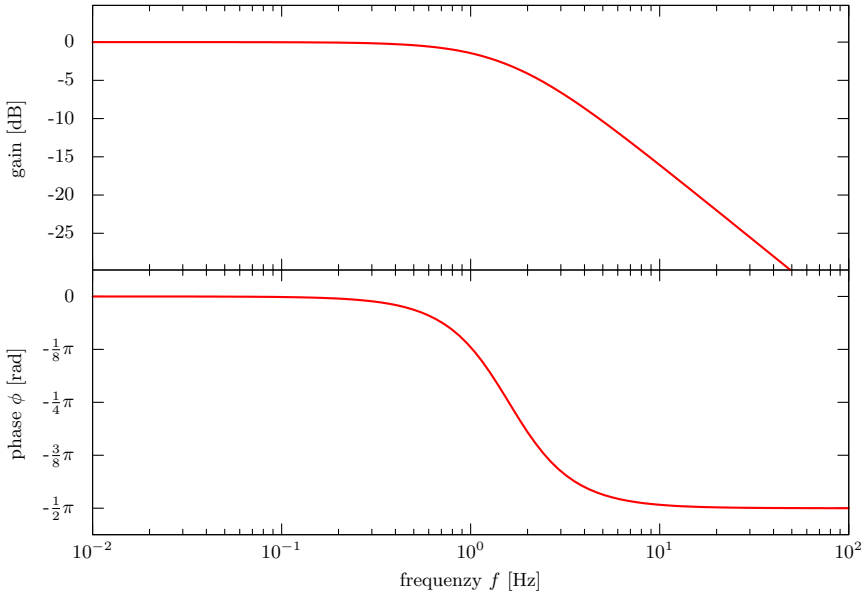

Abbildung 2: Bode plot of a Low-pass filter.

what u could need

- **help** ***command***
- set terminal *terminal*
- set output '*filename*'
- set {l|r|t|b}margin 0
- set multiplot
- set size *fraction,fraction*
- set origin *position*
- set logscale x|y
- set border *natural*
  - 1 bottom
  - 2 left
  - 4 top
  - 8 right

  sum the values for the borders you want.

Exercise 3

plot a Cardioid like Abb. (3). It's function is

$$\vec{r} \quad = \quad \big(1+\cos(t)\big) \cdot \begin{pmatrix} \cos(t) \\ \sin(t) \end{pmatrix}$$

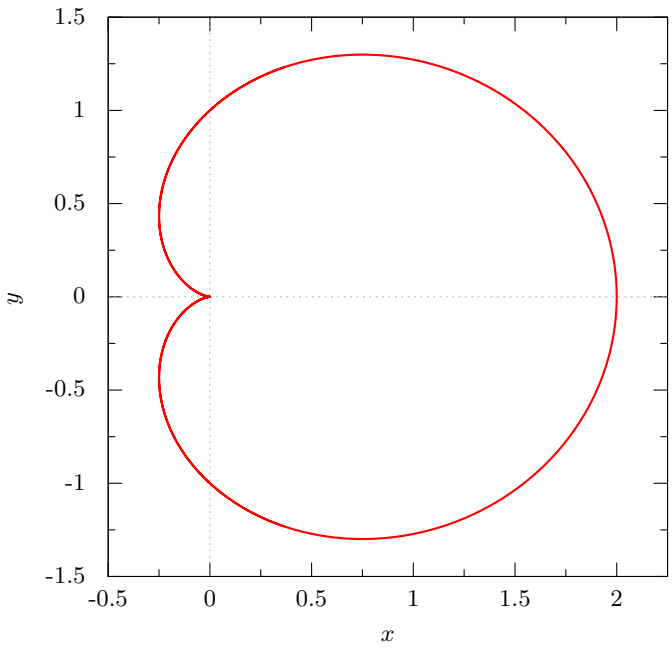

Abbildung 3: Cardioid.

what u could need

- set parametric
- set size square