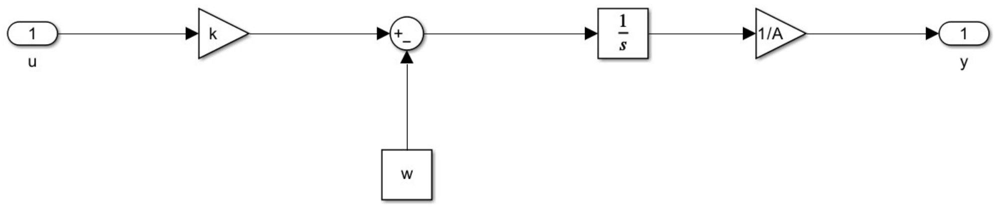
Øving 1

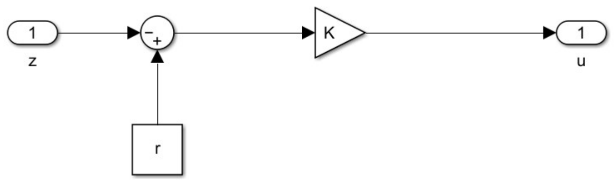
fredag 23. august 2024 13:19

Oppg. 1a)

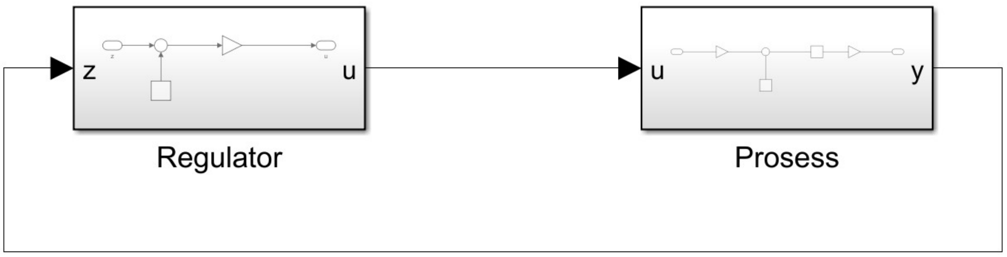
Prosess:



Regulator:

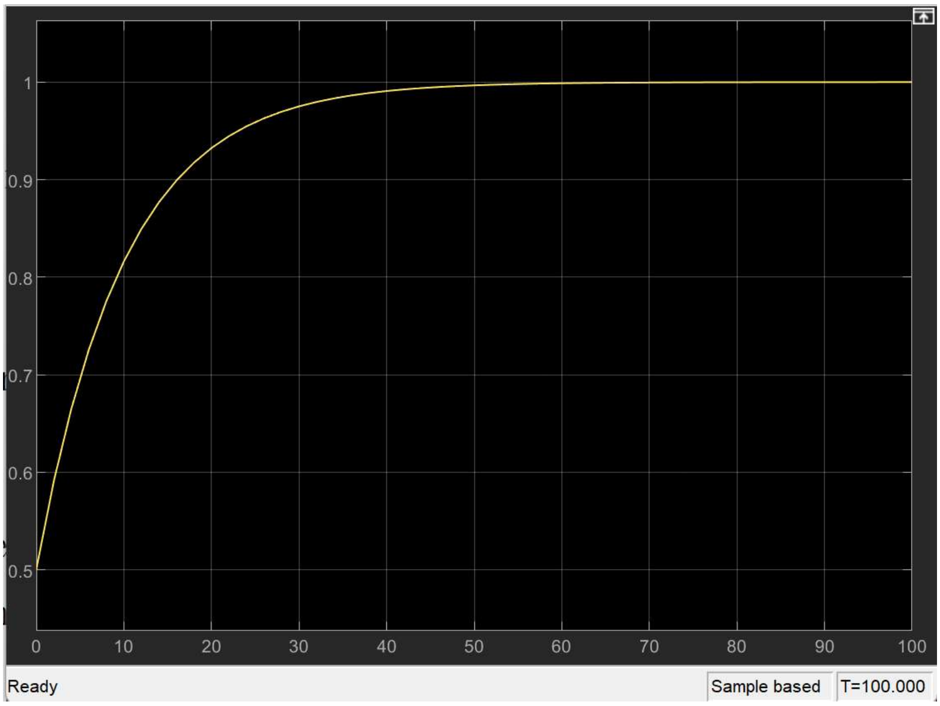


Systemet i lukket sløyfe:

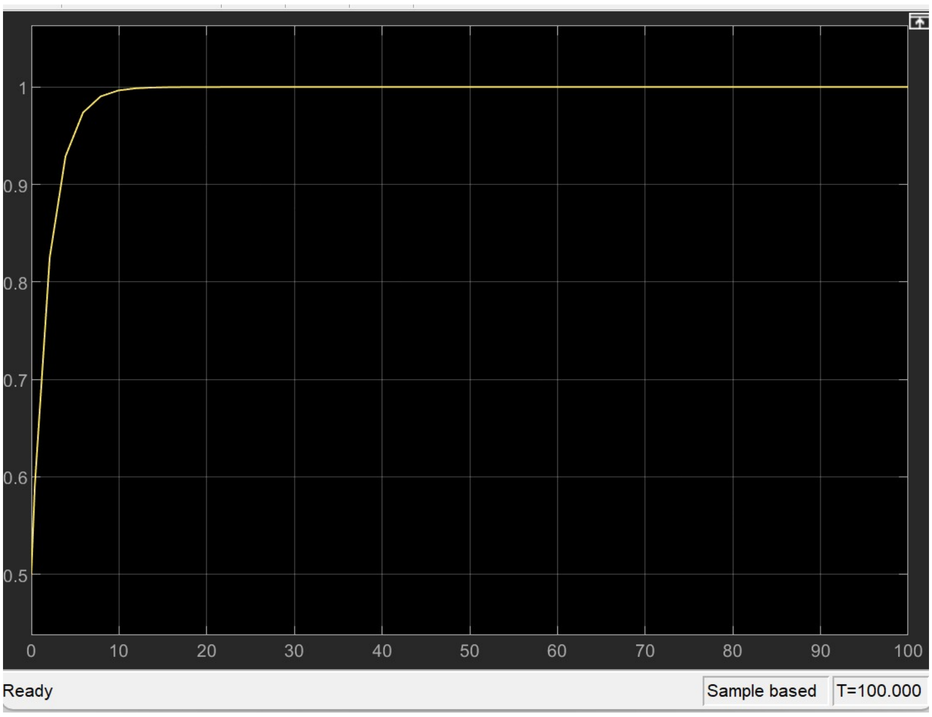


1b)

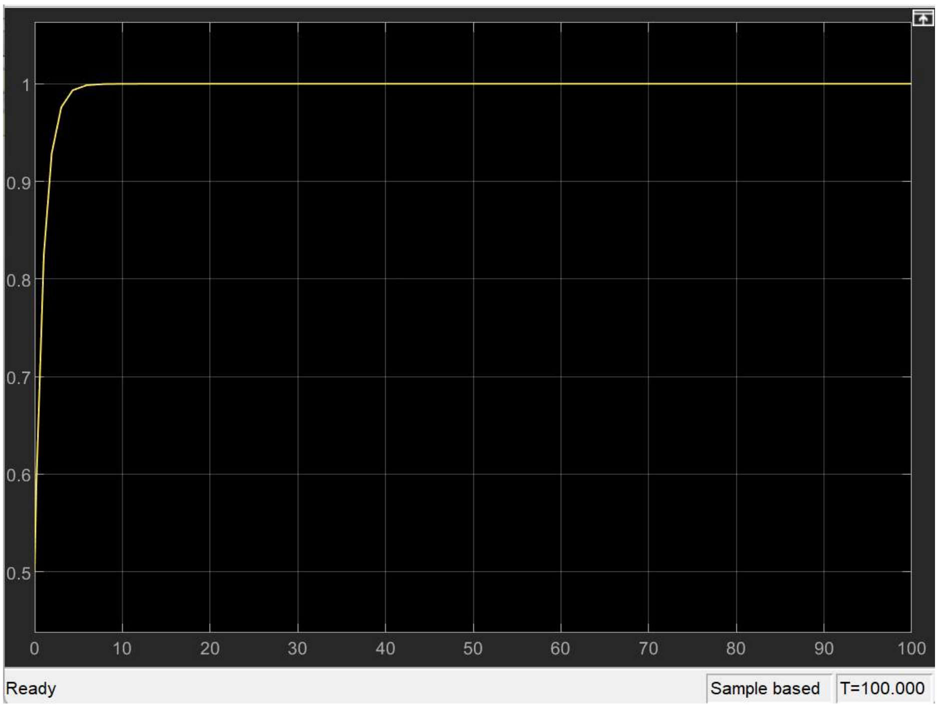
K=0.1



K=0.5



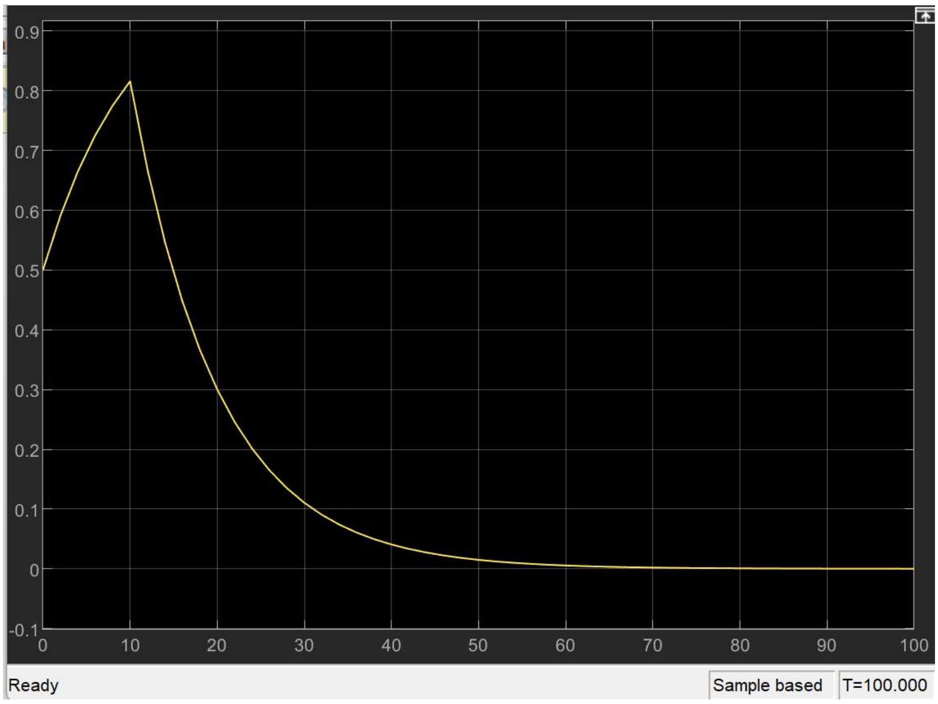
K=1



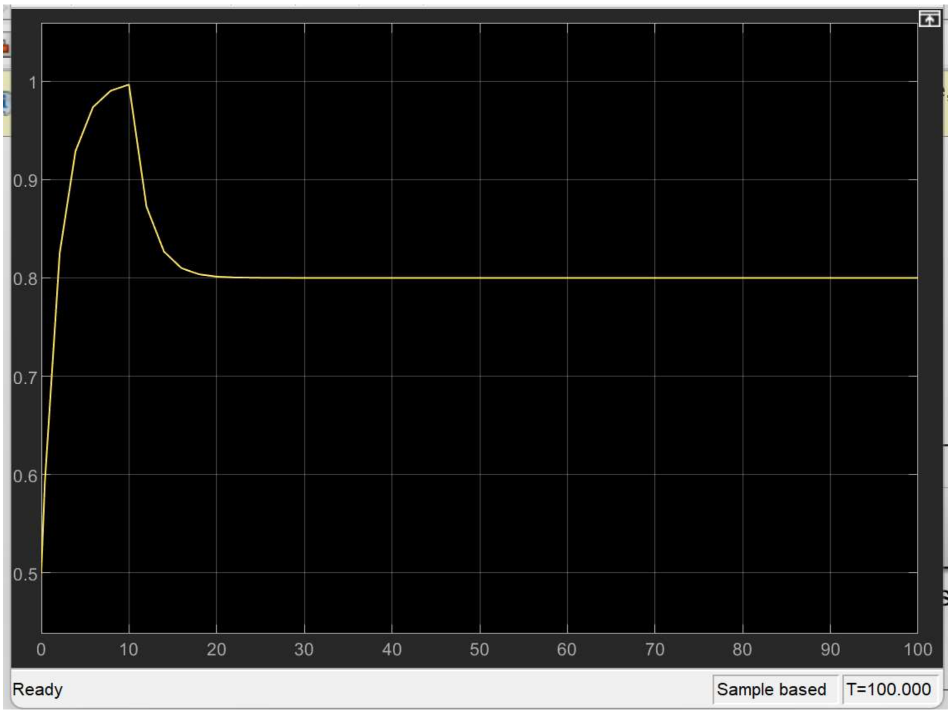
Vi ser at vi får raskere respons med høyere K

1c)

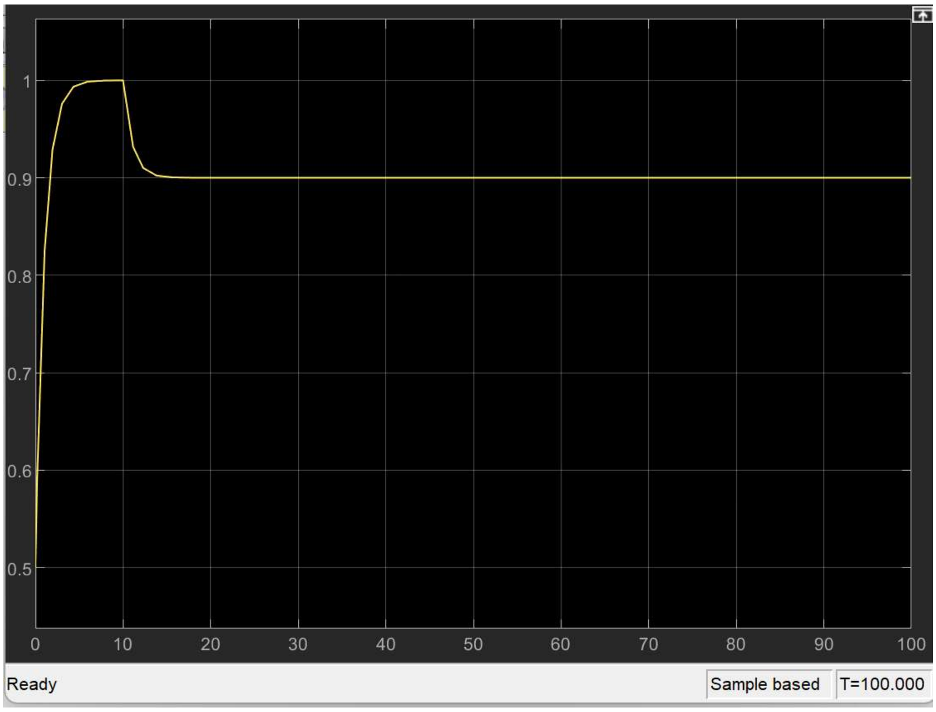
K=0.1



K=0.5

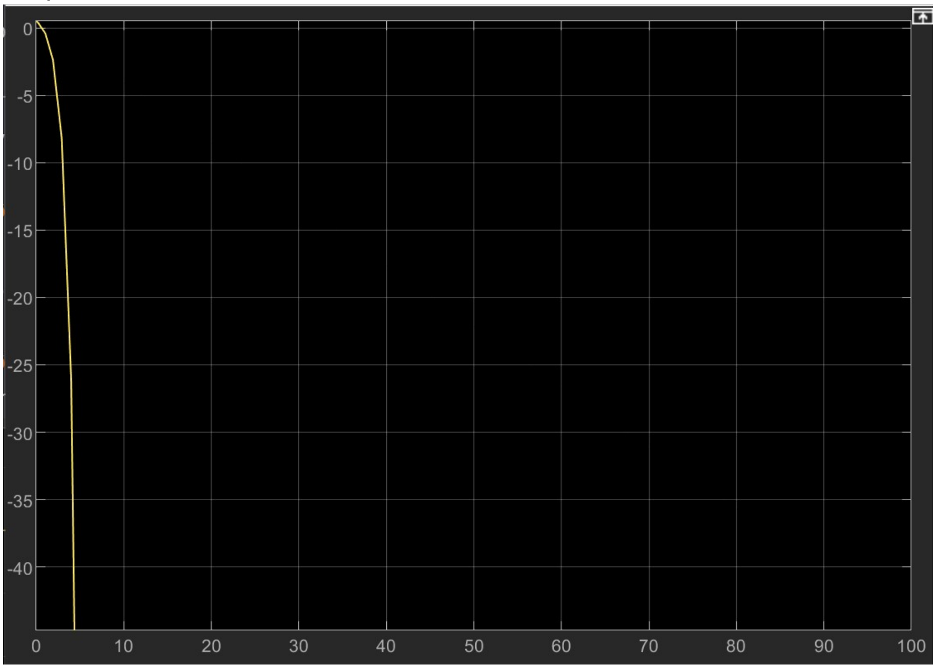


K=1



Det stasjonære avviket blir mindre med større K

1d)



Vi ser at systemet ikke fungerer fordi vi får et negativt vinnivå som fortsetter å minke. Vi integrerer over k*u(t) i modellen, og det uttrykket vil hele tiden være negativt. Derfor vil integralet fortsette å minke sammen med vinnivået.

2a) og 2b)

$$\dot{y}(t) = \lambda y(t), \quad y(0) = 1$$

$$y(t) = C e^{\lambda t}$$

$$y(t) = Ce^{\lambda t}$$

$$y(0) = C = 1$$

$$y(t) = e^{\lambda t}$$

Løsningen vokser for λ > 0
Løsningen synker for λ < 0
Løsningen er konstant lik 1 for λ = 0

2c)

$$\dot{y}(t) = \lambda y(t) + bu(t), \quad y(0) = 0$$

$$u(t) = \begin{cases} 1 & t \geq 0 \\ 0 & t < 0 \end{cases}$$

Løser $\dot{y} = \lambda y + b$ først

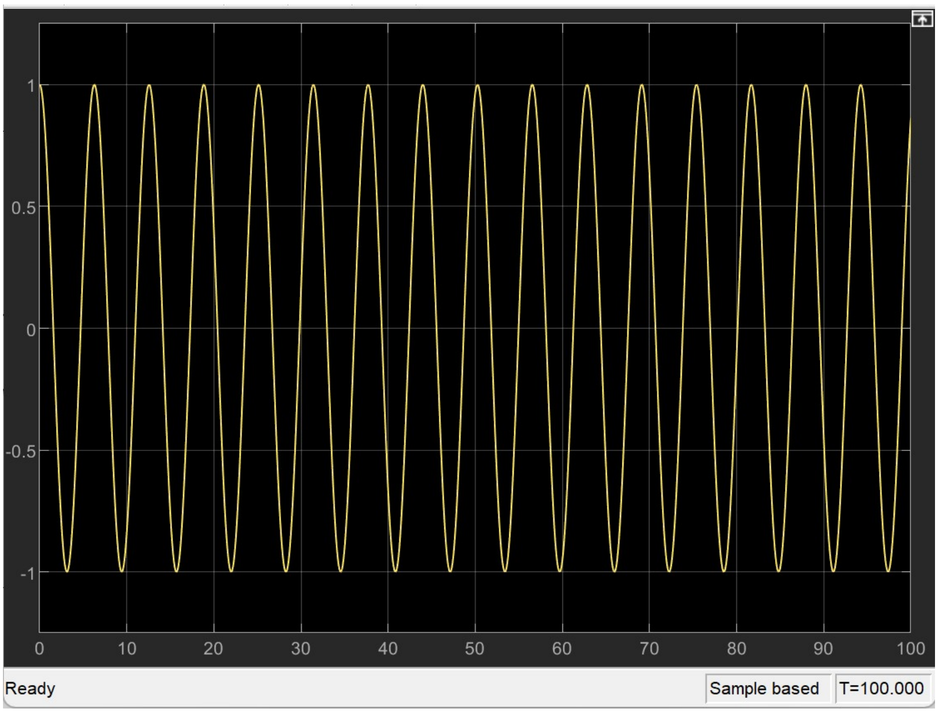
$$y_{temp}(t) = Ce^{\lambda t} - \frac{b}{\lambda}$$

$$y(0) = C - \frac{b}{\lambda} = 0 \Rightarrow C = \frac{b}{\lambda}$$

$$y(t) = \left(\frac{b}{\lambda}e^{\lambda t} - \frac{b}{\lambda}\right)u(t)$$

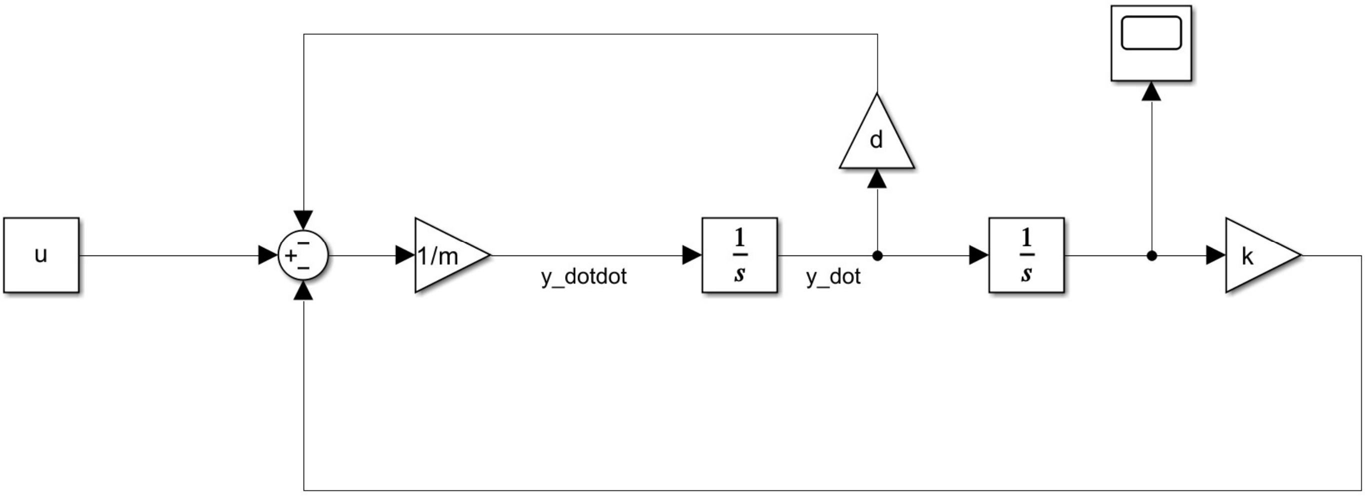
$$= \frac{b}{\lambda}u(t)\left[e^{\lambda t} - 1\right]$$

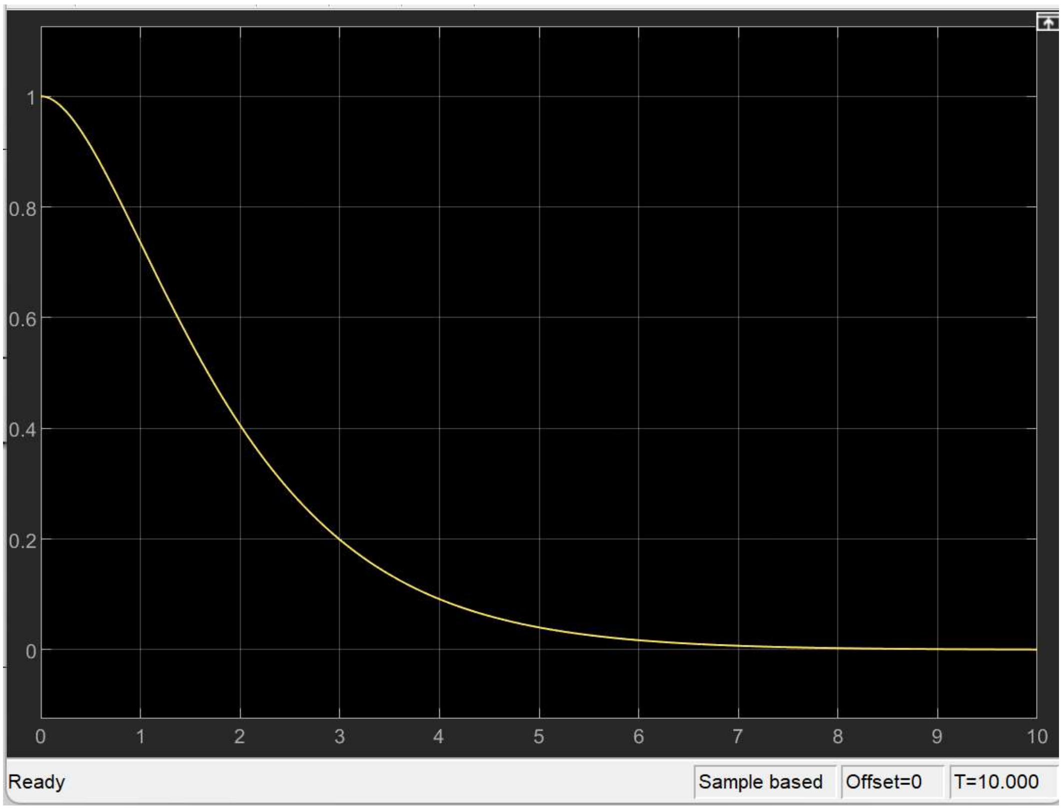
Oppg. 3a)



Vi får stående svingninger

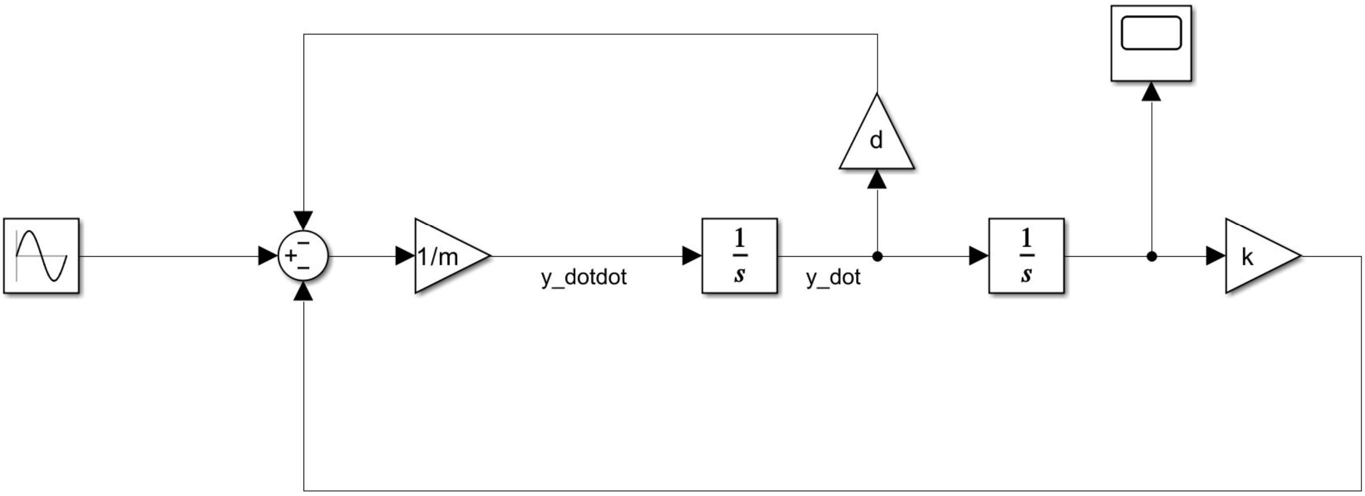
3b)

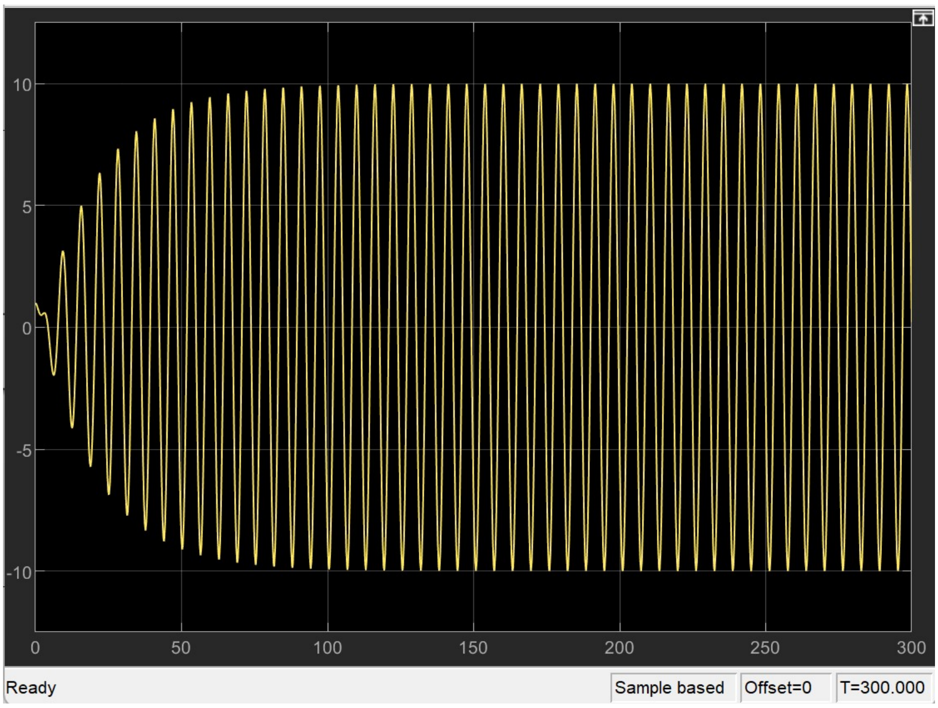




Svingningene forsvinner rundt d=2

3c)





Ved omega = 1 beveger massen seg mest. Den får størst amplitude på 5 og fortsetter å oscillere for alltid.