Computing controllers using Kessler's methods

Compute and declare my transfer function

The transfer function has the following form:

$$H_f(s) = \frac{K_f}{s(T_f s + 1)}$$

Knowing that my values are Kf = 4 and Tf = 8, the function becomes:

$$H_f(s) = \frac{4}{s(8s + 1)}$$

I declare my transfer function in code:

```
Kf = 4;
Tf = 8;
Hf = tf(Kf,[Tf 1 0])
```

```
Hf =

      4
  ---------
  8 s^2 + s

Continuous-time transfer function.
```

Modulus Criterion

We choose T_Σ equal with T_f

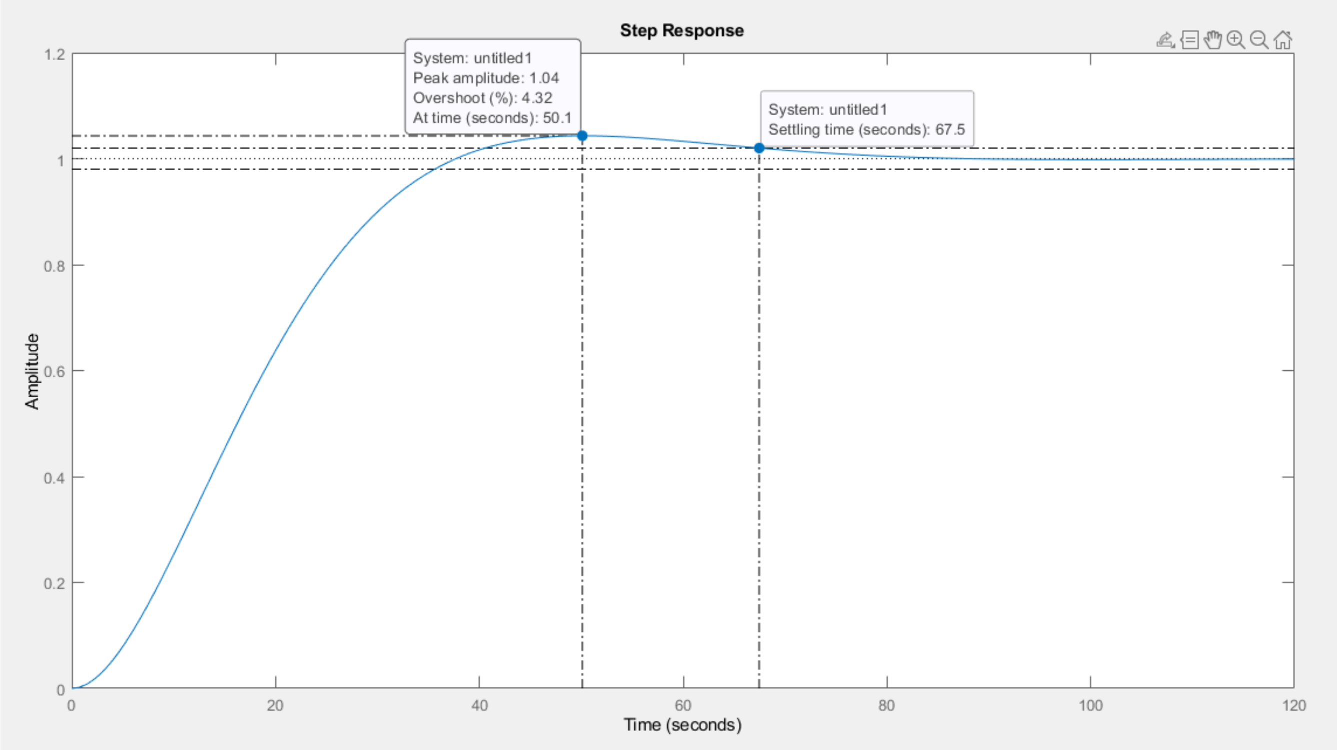
We compute $H_d^* = \dfrac{1}{2T_\Sigma s(T_\Sigma s + 1)}$

```
Hdstar = tf(1, [2*Tf^2 2*Tf 0])
```

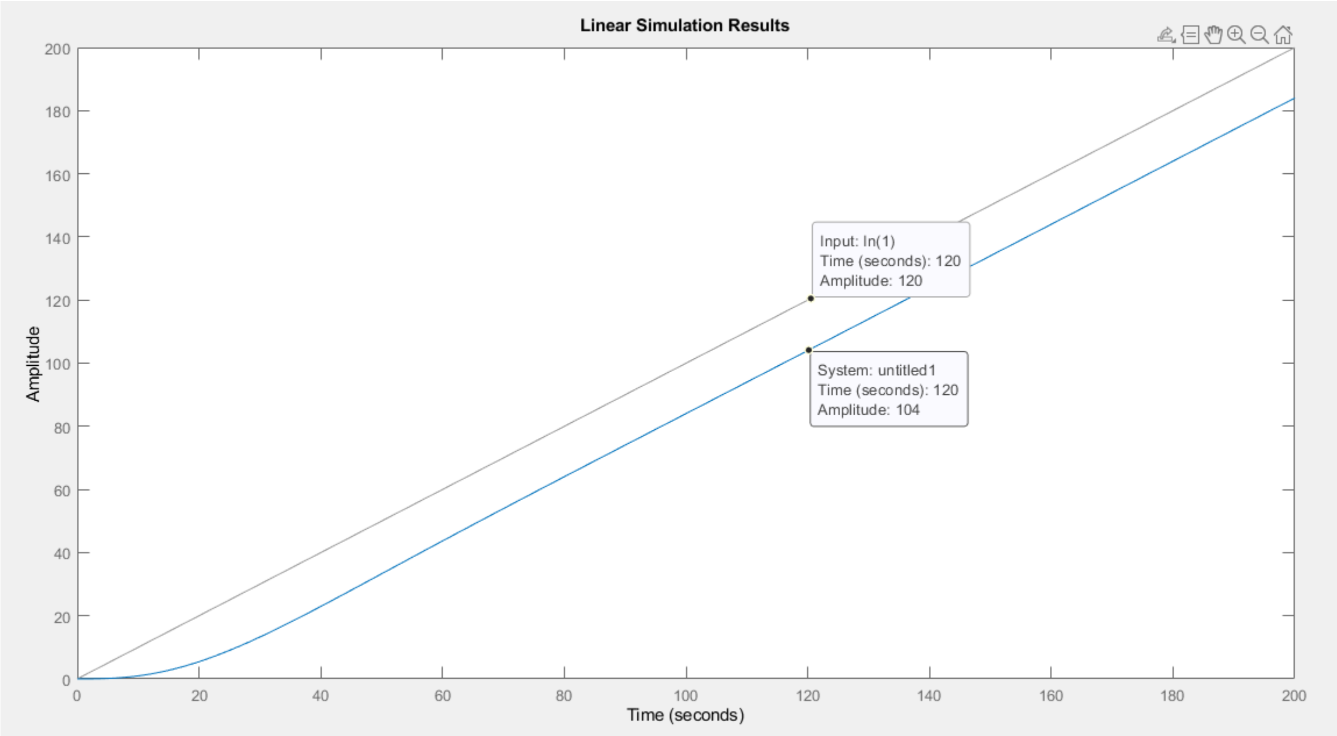
```
Hdstar =

        1
  --------------
  128 s^2 + 16 s

Continuous-time transfer function.
```

We compute $H_R = \dfrac{H_d^*}{H_f}$

```
Hr = minreal(Hdstar/Hf);
% step response
%step(feedback(Hr*Hf,1))
```




```
% ramp response
t = 0:1:200;
%lsim(feedback(Hr*Hf,1),t,t)
```



```
wn = 1/sqrt(2)/Tf
```

```
wn = 0.0884
```

```
zetta = 1/sqrt(2)
```

```
zetta = 0.7071
```

```
ts = 8*Tf
```

```
ts = 64
```

```
overshoot = 0.043
```

```
overshoot = 0.0430
```

```
cv = 1/2/Tf
```

```
cv = 0.0625
```

```
steadyStateError = 2*Tf
```

```
steadyStateError = 16
```

Symmetry Criterion

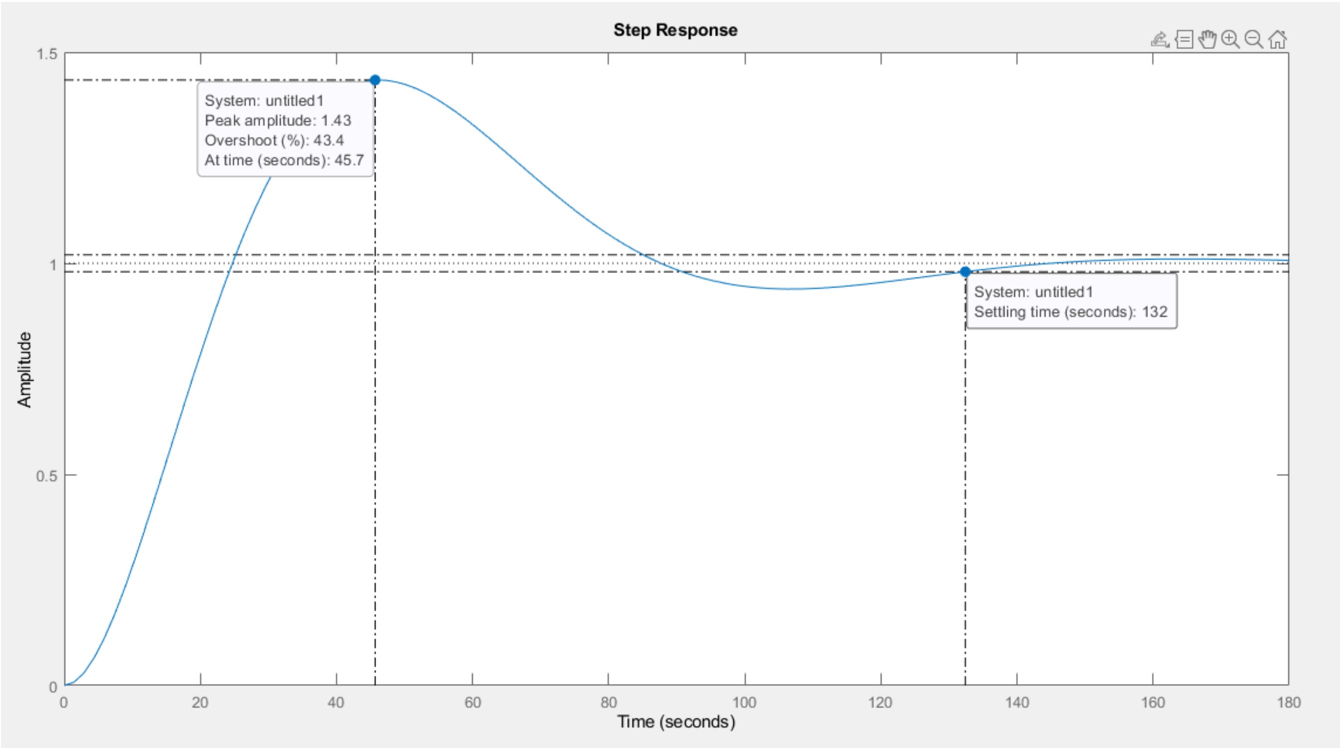
We compute $H_d^* = \frac{4T_\Sigma s + 1}{8T_\Sigma^2 s^2 (T_\Sigma s + 1)}$

```
Hdstar = tf([4*Tf 1], [8*Tf^3 8*Tf^2 0 0])
```

```
Hdstar =
 
       32 s + 1
  ------------------
  4096 s^3 + 512 s^2
 
Continuous-time transfer function.
```

We compute $H_R = \frac{H_d^*}{H_f}$

```
Hr = minreal(Hdstar/Hf);
% step response
%step(feedback(Hr*Hf,1))
```




```
% ramp response
t = 0:1:200;
%lsim(feedback(Hr*Hf,1),t,t)
```