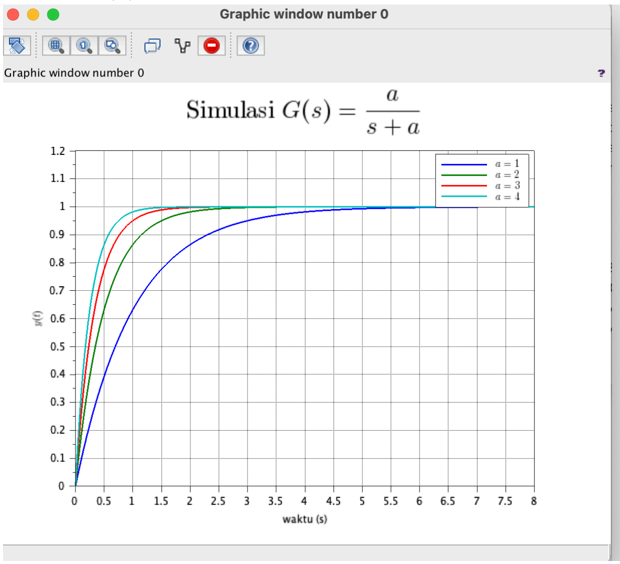
Laporan Sementara

Airlangga Rasyad Fidiyanto
19/443562/TK/48758

1. Plot $G(s)$



nomer_satu.sce

```
clear;
clc;

// Inisiasi variabel laplace dan waktu
s = poly(0, 's');
t = 0:0.02:8;

// Inisiasi sistem yang akan disimulasikan
y = []

for i = 1:4
    G = i / (s + i);
    sys_G = syslin('c', G);
    y1 = csim('step', t, sys_G);
    
    y = cat(1, y, y1)
end

// Plot
title('$\text{Simulasi } G(s) = \frac{a}{s + a}$', 'fontsize', 5)
plot(t, y, 'LineWidth',3)
xlabel('waktu (s)')
ylabel('$y(t)$')
xgrid(1)
h1 = legend(['$a = 1$' '$a = 2$' '$a = 3$' '$a = 4$']);
```

Output

Scilab branch-6.1 Console

```
a = 1
Rise time     : 2.197
Settling time: 3.913

a = 2
Rise time     : 1.099
Settling time: 1.957

a = 3
Rise time     : 0.732
Settling time: 1.305

a = 4
Rise time     : 0.549
Settling time: 0.979


-->
```

/Users/airlanggafidiyanto/Documents/Kuliah/Semester 4/Prakt. Instumentasi dan Kendali/Unit 2/nomer_satu.sce - SciNotes

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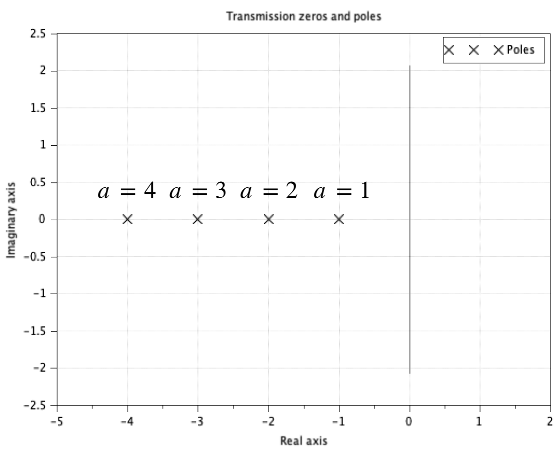
```
clear
clc

s = poly(0, 's');
t = 0:0.001:5;

for i = 1:4
    printf('a = %i', i)
    
    sys_G = i / (s + i);
    sys = syslin('c', sys_G);
    
    sim_result = csim('step', t, sys);
    
    time_20_os = find(sim_result <= 0.98); // Waktu ketika overshoot 20%
    settling_time = time_20_os($) * 0.001 // Settling time
    
    time_90 = find(sim_result >= 0.9); // Waktu ketika >= 90% dari target
    time_10 = find(sim_result >= 0.1); // Waktu ketika >= 10% dari target
    
    rise_time = (time_90(1) - time_10(1)) * 0.001 // Rise time
    
    printf('\nRise time    : %.3f', rise_time)
    printf('\nSettling time: %.3f \n\n', settling_time)
end
```

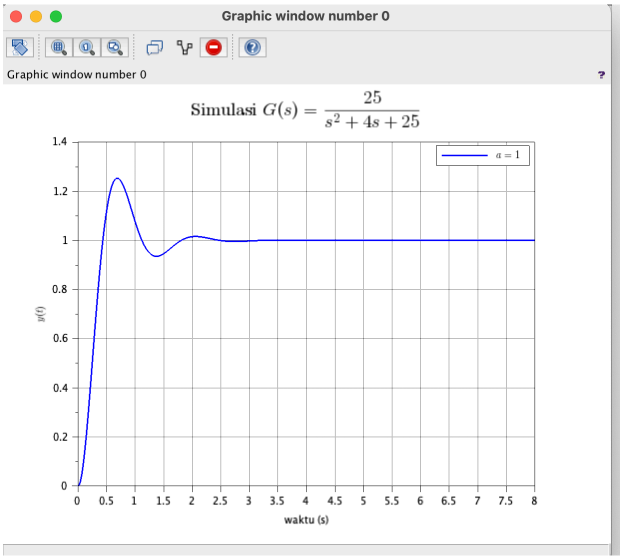
Plot Pole(s)




```
s = poly(0,'s');
n = [1 2 3 4]
d = [s+1 s+2 s+3 s+4];
h = syslin('c',n./d);
plzr(h);
```

2. Diberikan $G(s) = \dfrac{25}{s^2 + 4s + 25}$

   a. Simulasi



nomer_satu.sce

```
clear;
clc;

// Inisiasi variabel laplace dan waktu
s = poly(0, 's');
t = 0:0.02:8;

// Inisiasi sistem yang akan disimulasikan
G = 25 / (s^2 + 4*s + 25);
sys_G = syslin('c', G);
y1 = csim('step', t, sys_G);

// Plot
title('$\text{Simulasi } G(s) = \frac{25}{s^2 + 4s + 25}$', 'fontsize', 4)
plot(t, y1, 'LineWidth',3)
xlabel('waktu (s)')
ylabel('$y(t)$')
xgrid(1)
h1 = legend(['$a = 1$' '$a = 2$' '$a = 3$' '$a = 4$']);
```

Overshoot percentage, settling time, dan *rise time*

```
Overshoot     : 25.383%
Rise time     : 0.292
Settling time : 1.682


-->
```

fsffafa.sce

```
clear
clc

s = poly(0, 's');
t = 0:0.001:5;

sys_G = 25 / (s^2 + 4*s + 25);
sys = syslin('c', sys_G);

sim_result = csim('step', t, sys);

time_20_os = find(sim_result <= 0.98); // Waktu ketika overshoot 20%
settling_time = time_20_os($) * 0.001 // Settling time

time_90 = find(sim_result >= 0.9); // Waktu ketika >= 90% dari target
time_10 = find(sim_result >= 0.1); // Waktu ketika >= 10% dari target

rise_time = (time_90(1) - time_10(1)) * 0.001 // Rise time

max_val = max(sim_result);
perct = abs(1 - max_val) * 100;

printf('\nOvershoot     : %.3f%%', perct)
printf('\nRise time     : %.3f', rise_time)
printf('\nSettling time : %.3f \n\n', settling_time)
```

Misalkan pole $G(s)$ yang baru sebagai $s_1 = -2p + j\sqrt{21}$ dan $s_2 = -2p - j\sqrt{21}$ dengan $p \in \mathbf{R}$. Suatu sistem persamaan kuadrat haruslah memenuhi $s^2 - (s_1 + s_2)\,s + s_1 s_2 = 0$, sehingga

$$s^2 - (s_1 + s_2)\,s + s_1 s_2 = s^2 + as + b$$

Maka

$$a = -(s_1 + s_2) = 4p$$
$$b = s_1 s_2 = 4p^2 + 21$$

   b. Agar bagian riil naik 2x lipat maka $p = 2$, sehingga $a = 8$ dan $b = 37$

   c. Agar bagian riil naik 0.5x lipat maka $p = 2$, sehingga $a = 2$ dan $b = 22$

Misalkan pole $G(s)$ yang baru sebagai $s_1 = -2 + jp\sqrt{21}$ dan $s_2 = -2 - jp\sqrt{21}$ dengan $p \in \mathbf{R}$. Suatu sistem persamaan kuadrat haruslah memenuhi $s^2 - (s_1 + s_2)\, s + s_1 s_2 = 0$, sehingga

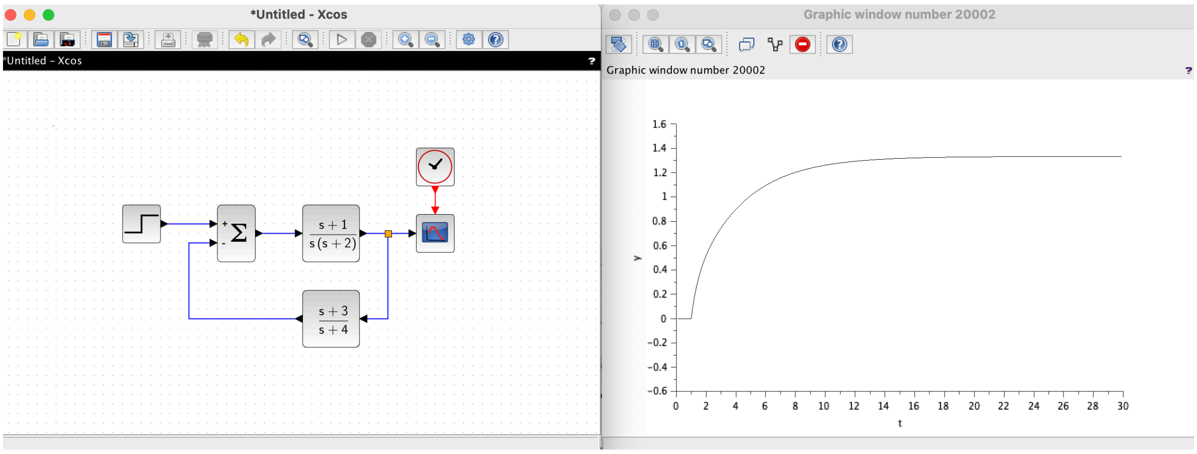
$$s^2 - (s_1 + s_2)\, s + s_1 s_2 = s^2 + as + b$$

Maka

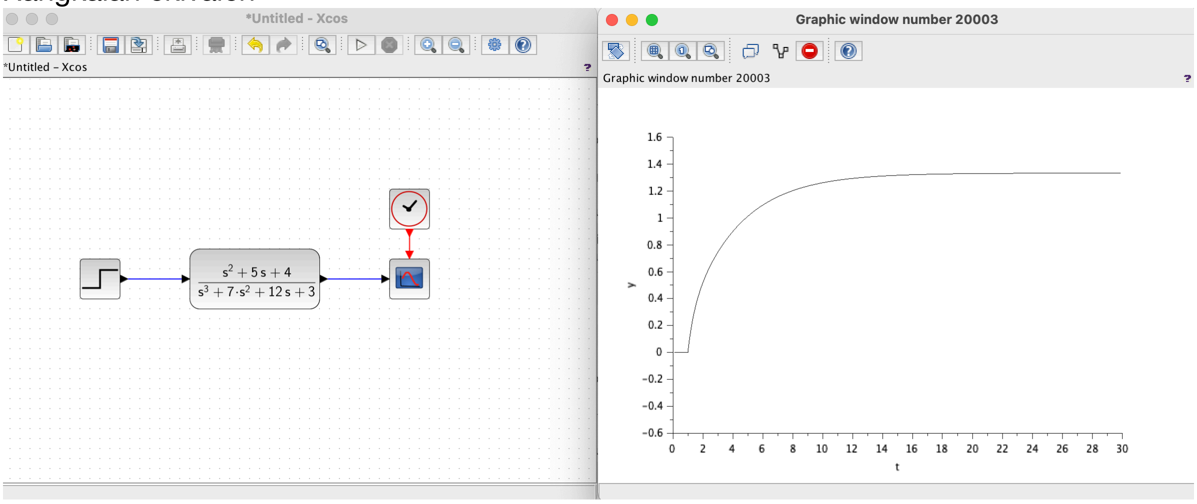
$$a = -(s_1 + s_2) = 4$$
$$b = s_1 s_2 = 4 + 21p^2$$

d. Agar bagian imajiner naik 2x lipat maka $p = 2$, sehingga $a = 4$ dan $b = 88$
e. Agar bagian imajiner naik 0.5x lipat maka $p = 0.5$, sehingga $a = 4$ dan $b = 9.25$

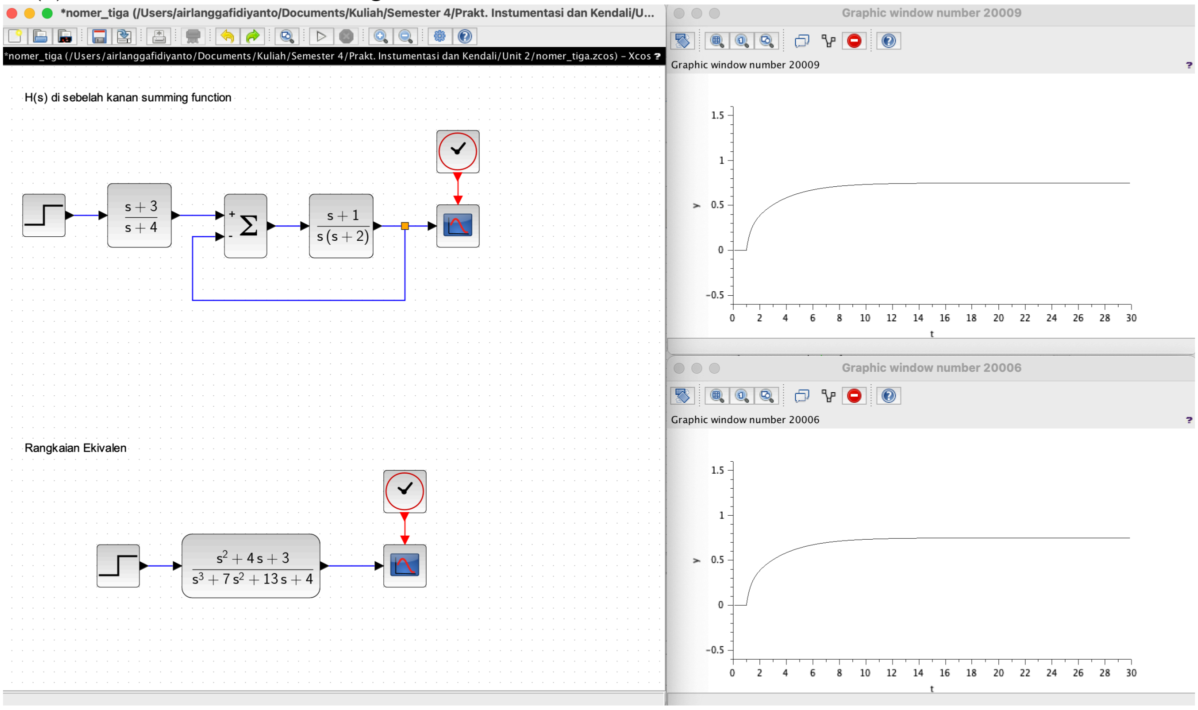
3. Diberikan diagram blok



a. Rangkaian ekivalen



b. $H(s)$ di sebelah kiri summing function



c. $H(s)$ di sebelah kanan summing function