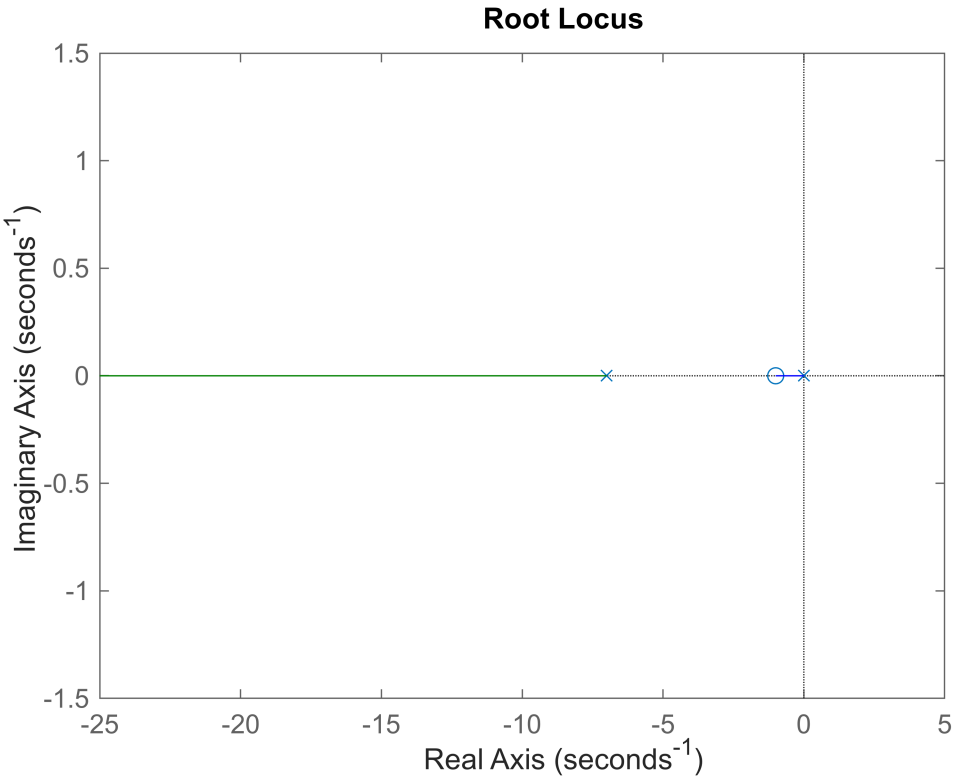
```
clear;
```

A1 Initial Guess

```
TI = 1;
a = 1.121041;
b = 7;

G = tf([TI 1], [TI 0])*tf([a], [1 b]);
rlocus(G)
```

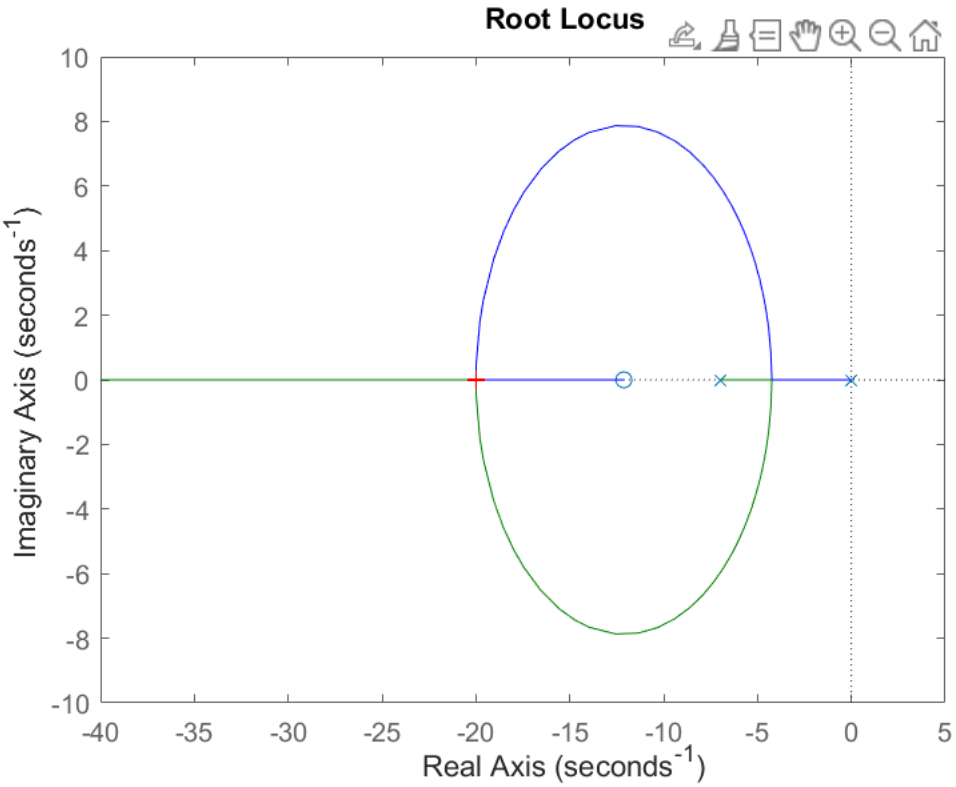


The right pole can not lower pass -2, pretty far from -20 (SPEC4).

A2 With the Capability

```
TI = 0.0825;
%TI = 0.0725;
a = 1.121041;
b = 7;

G = tf([TI 1], [TI 0])*tf([a], [1 b]);
rlocus(G)
[K, poles] = rlocfind(G)
```

```
Select a point in the graphics window
```




```
selected_point = -19.9882 - 0.0207i
K = 29.4369
poles = 2×1 complex
 -20.0000 + 0.0170i
 -20.0000 - 0.0170i
```

A3 K and TI found

Run Before Running the Simulink Model

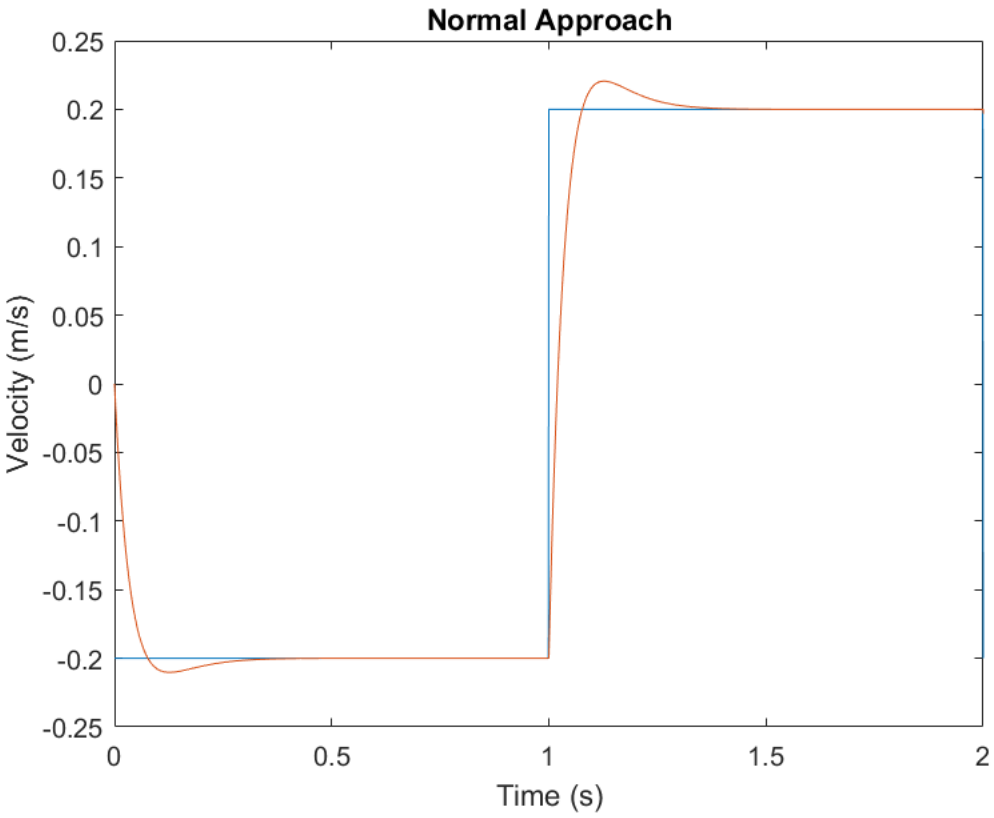
```
theta = 0;
VMAX_UPM = 11.75;
```

Run After Running the Simulink Model

A4

```
% Load the Simulink model
model = 'lab3_sim';
load_system(model);

% Set the solver type to a fixed-step solver
set_param(model, 'SolverType', 'Fixed-step');

% Specify the fixed-step size
fixedStepSize = 0.001;
set_param(model, 'FixedStep', num2str(fixedStepSize));
```

```
% Run the simulation
simOut = sim(model);

plot(simout.Time, simout.Data)

xlim([0 2])
xlabel("Time (s)")
ylabel("Velocity (m/s)")
title("Normal Approach")
```



For Ts Estimation

```
% Lower bound
0.2 - 0.02*(0.2 - (-0.2))
```

```
ans = 0.1920
```

```
% Upper bound
0.2 + 0.02*(0.2 - (-0.2))
```

```
ans = 0.2080
```

```
% Ts = 1.23 s
% Mp = 0.020537
K
```

```
K = 29.4369
```

```
TI
```

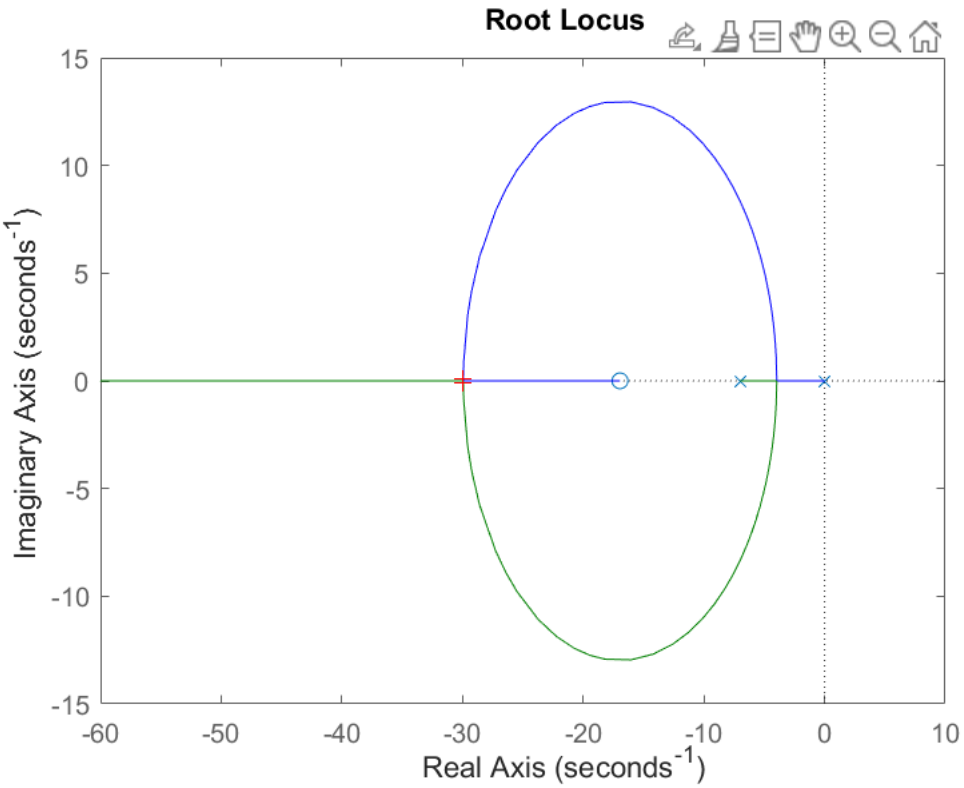
```
TI = 0.0825
```

```
% Following is the aggressive approach
```

A5 Aggressive

```
TI = 0.059;
a = 1.121041;
b = 7;

G = tf([TI 1], [TI 0])*tf([a], [1 b]);
rlocus(G)
[K, poles] = rlocfind(G)
```

```
Select a point in the graphics window
```




```
selected_point = -29.8657 - 0.0930i
K = 47.1611
poles = 2×1 complex
 -29.9347 + 0.0630i
 -29.9347 - 0.0630i
```

A6 K and TI found

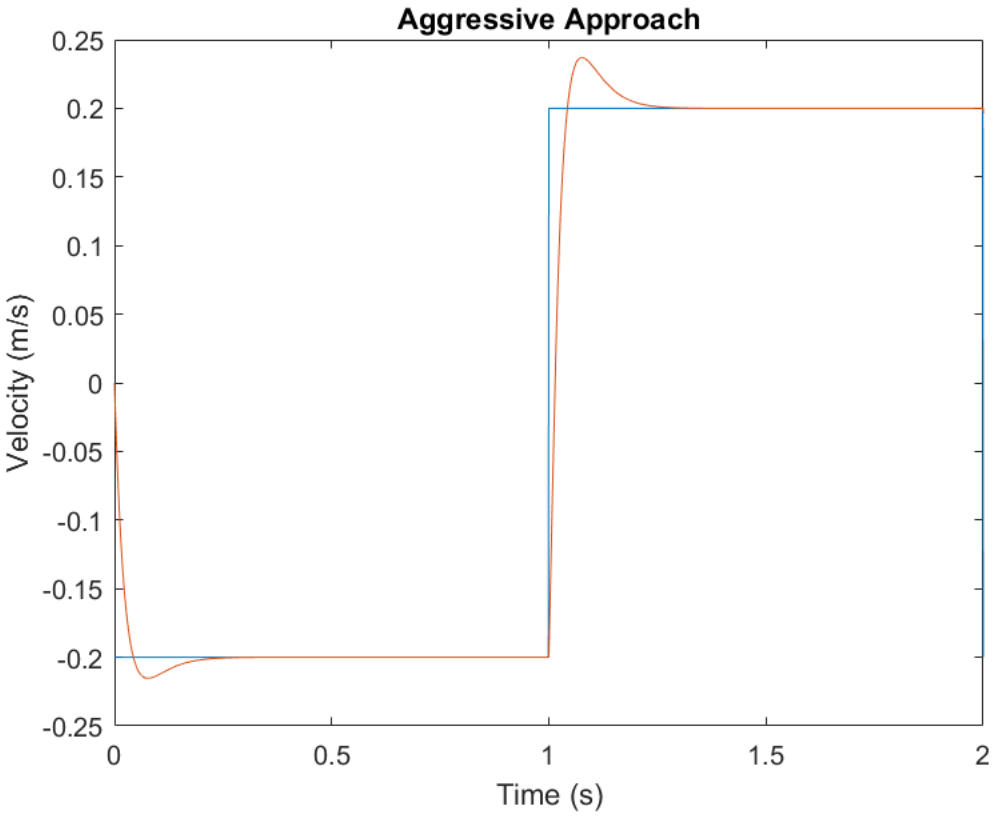
Run Before Running the Simulink Model

```
theta = 0;
VMAX_UPM = 11.75;
```

Run After Running the Simulink Model

A7

```
% Load the Simulink model
model = 'lab3_sim';
load_system(model);

% Set the solver type to a fixed-step solver
set_param(model, 'SolverType', 'Fixed-step');

% Specify the fixed-step size
fixedStepSize = 0.001;
set_param(model, 'FixedStep', num2str(fixedStepSize));

% Run the simulation
simOut = sim(model);

plot(simout.Time, simout.Data)
xlim([0 2])
xlabel("Time (s)")
ylabel("Velocity (m/s)")
title("Aggressive Approach")
```



For Ts Estimation

```
% Lower bound
0.2 - 0.02*(0.2 - (-0.2))
```

```
ans = 0.1920
```

```
% Upper bound
0.2 + 0.02*(0.2 - (-0.2))
```

```
ans = 0.2080
```

```
% Ts = 0.173 s
% Mp = 0.037008
K
```

```
K = 47.1611
```

```
TI
```

```
TI = 0.0590
```