5) $G(s) = \dfrac{100}{(s+0.5)(s+2)(s+6)}$ Now digital. $T = 0.2s$.

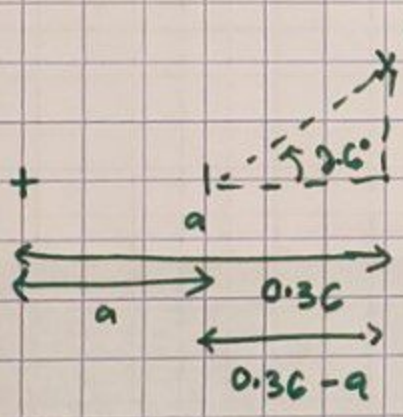
$$G_z(z) = 0.091349 \frac{(z+1)^2}{(z-0.9048)(z-0.6703)(z-0.3012)}$$

Need to add pole at DC ($(z-1)$ term) and have rlocus run through $0.3622 + j0.541$ (e^{sT} of $-2+j5$). Will likely need:

$$C(z) = \frac{(z-0.9048)(z-0.6703)}{(z-1)(z-a)}$$

same as before: $\angle G_z|_{z=0.3622\ldots} = \angle -177.3581°$

Need $2.6419°$ (actually pretty close as is)



$$\tan = \frac{0.54}{0.36-a} \rightarrow 0.36 - a = \frac{0.5}{\tan}$$

$$a = 0.36 - \frac{0.5}{\tan} \approx -11.8622\ldots$$

Can't do that ...

Ok, let's instead do:

$$C(z) = \frac{(z-0.9048)(z-0.3012)}{(z-1)(z-a)} \Rightarrow 147° \rightarrow -33°$$

$a \approx 1.2582$

Nope :/

Ok,

$$C(z) = \frac{(z-0.9048)(z+0.5)}{(z-1)(z-a)}$$

Ok. Need more terms...

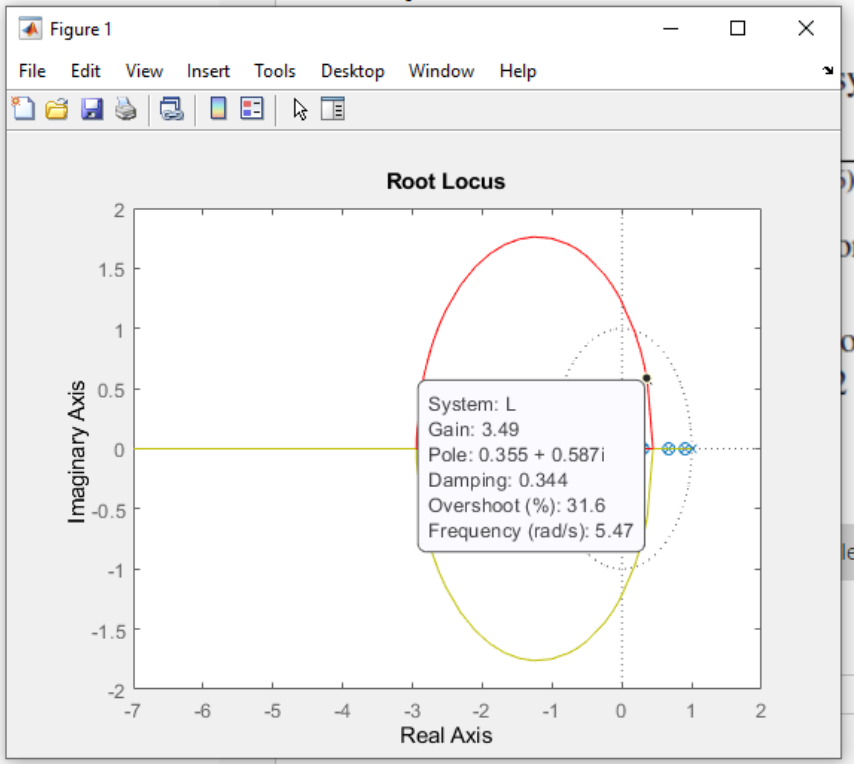
$$(G) = \frac{(z-0.9048)(z-0.6703)(z-0.3012)}{z(z-1)(z-a)}$$

↓

$a = -0.6481$ FINALLY!

$K \approx 3.49$

QUESTION 5



C: ▸ Users ▸ almos ▸ OneDrive ▸ Documents ▸ Control Systems ▸

Current Folder

Name

- html
- HW7
- HW8
- HW9
- HW10
- HW11
- Bode2.m
- dig_vs_an_freq...
- Digital Control ...
- ECE461 HW5 P...
- ECE461 HW5 P...
- ECE461 HW6 P...

transient_specs.m (Scri...

Editor - C:\Users\almos\OneDrive\Documents\Control Systems\nichols_on_tf.m

Bode2.m | Nichols2.m | transient_specs.m | nichols_on_data.m | nichols_on_tf.m

```
1 -    G = zpk([],[-0.1617,-1.04,-2.719,-5.05],1.4427, 'InputDela
2 -    w = logspace(-1,1,1001);
3 -    Gw = Bode2(G,w);
4 -    Nichols2(Gw,1.5);
```

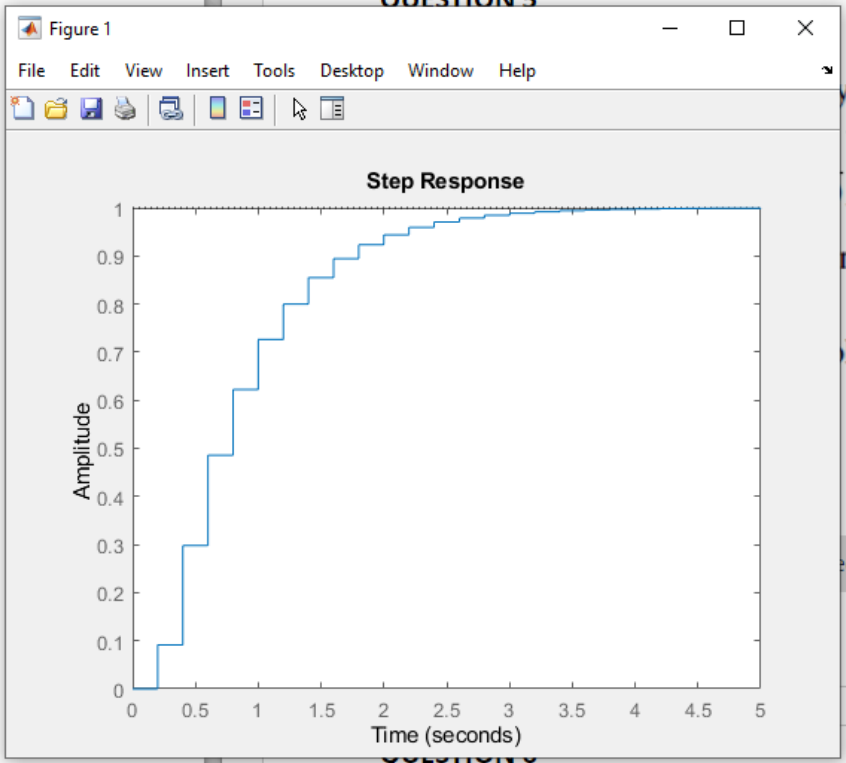
Command Window

New to MATLAB? See resources for Getting Started.

```
    29.1762

>> a = real(aaa) - imag(aaa)/tand(th)

a =

   -0.6481

>> C = zpk([0.9048,0.6703,0.3012],[1,0,a],1,0.2);
>> L = C*Gzas;
>> rlocus(L)
>> hold on;
>> plot(real(aaa),imag(aaa),'kx')
fx >>
```

6) Given the following stable system

QUESTION 5



Print Find Indent Advance Time
FILE NAVIGATE EDIT BREAKPOINTS RUN

C: ▸ Users ▸ almos ▸ OneDrive ▸ Documents ▸ Control Systems ▸

Current Folder

Name
- html
- HW7
- HW8
- HW9
- HW10
- HW11
- Bode2.m
- dig_vs_an_freq...
- Digital Control ...
- ECE461 HW5 P...
- ECE461 HW5 P...
- ECE461 HW6 P...

transient_specs.m (Scri...

Editor - C:\Users\almos\OneDrive\Documents\Control Systems\nichols_on_tf.m

Bode2.m | Nichols2.m | transient_specs.m | nichols_on_data.m | nichols_on_tf.m

```
1 -   G = zpk([],[-0.1617,-1.04,-2.719,-5.05],1.4427, 'InputDela
2 -   w = logspace(-1,1,1001);
3 -   Gw = Bode2(G,w);
4 -   Nichols2(Gw,1.5);
```

Command Window

New to MATLAB? See resources for Getting Started.

```
ans =

  struct with fields:

        RiseTime: 1.4000
    SettlingTime: 2.8000
     SettlingMin: 0.9233
     SettlingMax: 1.0000
       Overshoot: 4.5378e-04
      Undershoot: 0
            Peak: 1.0000
        PeakTime: 8.4000

fx >>
```

6) Given the following stable system