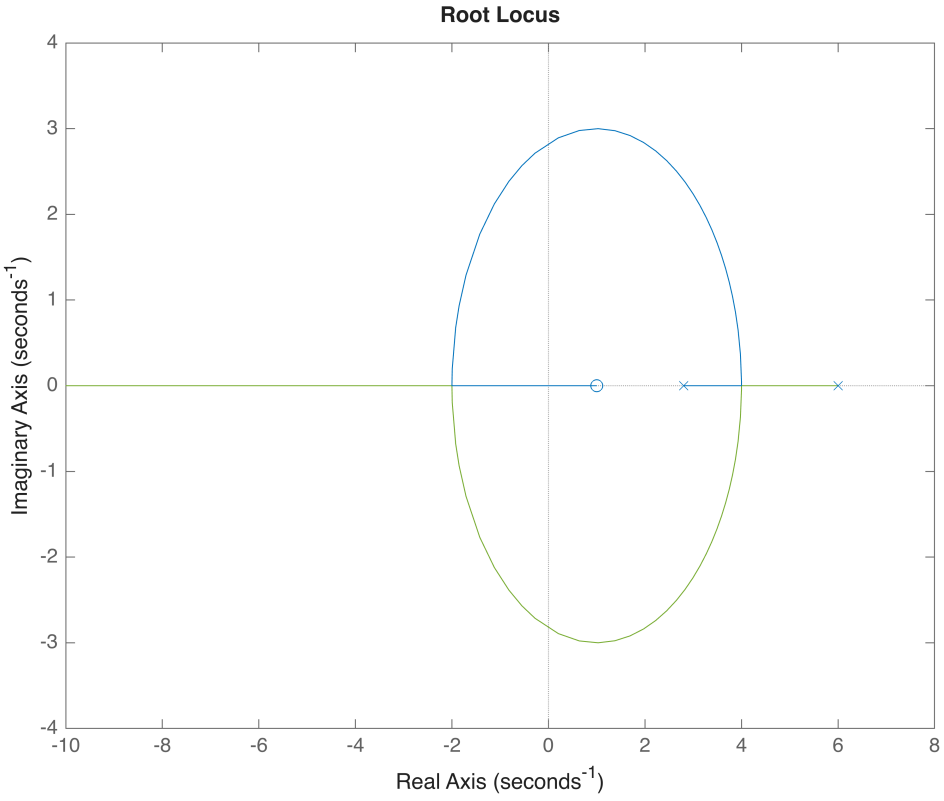
problem 2

```
% givens
s = zpk('s');
G = 5*(s-1)/(s-6);

% display
G
```

```
G =

  5 (s-1)
  -------
   (s-6)

Continuous-time zero/pole/gain model.
Model Properties
```

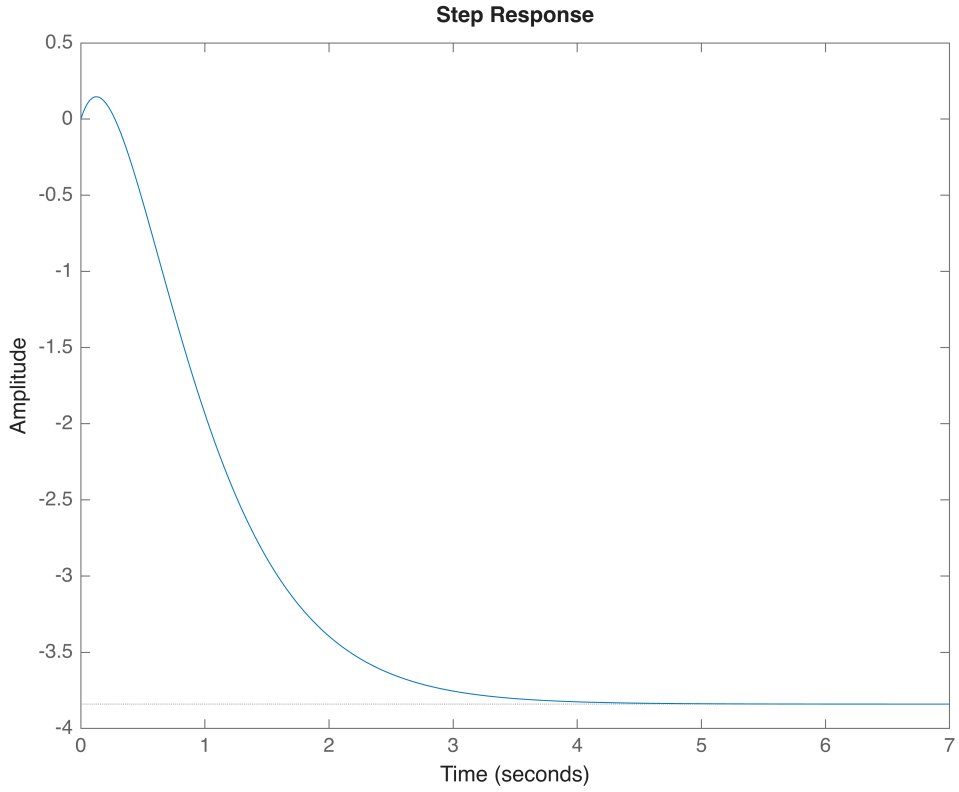
part b

```
K = 64/25;
p = 14/5;
H = K/(s-p);
L = H*G;

fig = figure;
rlocusplot(L);
saveas(fig, './images/s02b.png');
```



part c

```
syms s_sym

R = feedback(H, G);
R_info = stepinfo(R);

fig = figure;
stepplot(R);
saveas(fig, './images/s02c.png');
```




```
[R_num, R_den] = tfdata(R);
RN = poly2sym(R_num, s_sym);
RD = poly2sym(R_den, s_sym);
R_sym = RN/RD;
U_sym = R_sym/s_sym;
ut_sym = ilaplace(U_sym)
```

```
ut_sym =
```

$$\frac{96\,e^{-2t}}{25}+\frac{256\,t\,e^{-2t}}{25}-\frac{96}{25}$$

```
% display
R, R_info, ut_sym
```

```
R =

  2.56 (s-6)
  ----------
   (s+2)^2

Continuous-time zero/pole/gain model.
Model Properties
R_info = struct with fields:
         RiseTime: 1.6515
    TransientTime: 3.0421
     SettlingTime: 3.0640
      SettlingMin: -3.8400
      SettlingMax: -3.4571
        Overshoot: 0
       Undershoot: 3.8196
             Peak: 3.8400
         PeakTime: 7.8058
ut_sym =
```

$$\frac{96\,e^{-2t}}{25}+\frac{256\,t\,e^{-2t}}{25}-\frac{96}{25}$$

part d

```
% assuming sample time Ts = 1 second
Ts = 1/25;

% solution
[Ah, Bh, Ch, Dh] = ssdata(canon(H));
H_zoh.Ad = expm(Ah*Ts);
H_zoh.Bd = Ah \ (H_zoh.Ad-eye(size(Ah)))*Bh;
H_zoh.Cd = Ch;
H_zoh.Dd = Dh;

[Ad, Bd, Cd, Dd] = ssdata(c2d(H, Ts, 'tustin'));
H_tustin = struct('Ad', Ad, 'Bd', Bd, 'Cd', Cd, 'Dd', Dd);

% display tustin
H_zoh, H_tustin
```

```
H_zoh = struct with fields:
    Ad: 1.1185
    Bd: 0.0847
    Cd: 1.2800
    Dd: 0
H_tustin = struct with fields:
    Ad: 1.1186
    Bd: 0.3639
    Cd: 0.3158
    Dd: 0.0542
```