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Question 3

```
%%Setup
syms k1 k2 lambda
A = [0 1; 1 0];
B = [0;1];
```

Make M Matrix

M matrix is based on linear state feedback control

```
M = A - B*[k1 k2]
```

```
M =

[      0,   1]
[ 1 - k1, -k2]
```

Make Characteristic Equation and Subsitute estimator poles

```
charEq = det(M - lambda*[1 0;0 1]) == 0
eq1 = subs(charEq, lambda, -2 )
eq2 = subs(charEq, lambda, -3 )
```

```
charEq =

lambda^2 + k2*lambda + k1 - 1 == 0
```

```
eq1 =

k1 - 2*k2 + 3 == 0
```

```
eq2 =

k1 - 3*k2 + 8 == 0
```

Solve for Ks

```
eqs = [eq1 eq2];
ks = [k1 k2]
[solvK1, solvK2] = solve(eqs, ks)

K = [solvK1; solvK2]

% The controller is a linear state feedback controller
% The output state is used to affect input
% input to the system becomes U = -K*x
```

```
ks =

[ k1, k2]


solvK1 =

7


solvK2 =

5


K =

 7
 5
```

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