1) Do row reduction on A to RREF:

R2-3R1, then -1/3 R2, then R1-3R2.  Thus:

|1 -3| |1   0  |  |1  0|

|0  1| |0 -1/3|  |-3 1|

times A equals I.  Now solve for A

2) Compute using Gauss-Jordan that A^{-1} equals

1/2 1/2 -1/2

1/2 -1/2 1/2

-1/2 1/2 1/2

Then multiply this by b.

6) a) determinant equals 6

b) Remember

x = det(A\_1(b)) / det(A)

y = det(A\_2(b)) / det(A)

det(A) = 7

A\_1(b) equals

5 -1

-1 3

A\_2(b)  equals

2 5

1 -1

Now solve for x,y.

7) Eigenvalues 1, 2.  algebraic multiplicity of the eigenvalue 2 is 2.

E\_1 has basis [0,-1,1]

E\_2 has basis {[0,1,0], [-1,0,1]}

Can make P equal

0 0 -1

-2 1 0

1 0 1

and D equal to

1 0 0

0 2 0

0 0 2

9)

a) Ax = 3x.  Therefore,

(A^2 - 5A + 2I) x = A^2 x - 5Ax + 2x = AAx - 5Ax + 2x

= A(3x) - 5(3x) + 2x = 3Ax - 15x + 2x = 3(3x) - 15x + 2x = -4x.

Thus, x is an eigenvalue of A^2 + 5A + 2I, with eigenvalue -4.

b) We have P^{-1} AP = B and x is an eigenvector for A.  Write Ax = \lambda x for some eigenvalue \lambda.

Want to show that P^{-1} x is an eigenvector of B.  Well:

B P^{-1} x = P^{-1} A P P^{-1} x = P^{-1} Ax = P^{-1} \lambda x

= \lambda P^{-1} x.