H4

1. $Ax = \lambda x$

$$Ax = \begin{pmatrix} -4 & 0 & 10 \\ 0 & -2 & 0 \\ -3 & 0 & 7 \end{pmatrix} \begin{pmatrix} 5 \\ 0 \\ 3 \end{pmatrix} = \begin{pmatrix} 10 \\ 0 \\ 6 \end{pmatrix} = 2 \begin{pmatrix} 5 \\ 0 \\ 3 \end{pmatrix} = 2x$$

$\lambda = 2$

eigen value corresponding to x is 2

2. $B = \begin{pmatrix} 3 & 2 \\ -1 & -1 \end{pmatrix}$

$Bx = \lambda x$

$(B - \lambda) x = 0$

$$\begin{pmatrix} 3-\lambda & 2 \\ -1 & -1-\lambda \end{pmatrix} x = 0$$

$(3-\lambda)(-1-\lambda) + 2 = 0$

$-3 + \lambda - 3\lambda + \lambda^2 + 2 = 0$

$\lambda^2 - 2\lambda - 1 = 0 \qquad (\lambda - 1)^2 = 2 \qquad \lambda - 1 = \pm\sqrt{2}$

$\lambda = 1 \pm \sqrt{2}$

$\lambda = 1 + \sqrt{2} \implies \vec{x} = (1 \quad \sqrt{2} - 2)^T \cdot t \qquad t \neq 0$

$\lambda = 1 - \sqrt{2} \implies \vec{x} = (t \quad -\sqrt{2} - 2)^T \cdot t \qquad t \neq 0$

H4-3

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```
#Lu Lu H4-3
#For the matrixAin problem 1, compute the following.
A = matrix(3,3,[-4, 0, 10, 0, -2, 0, -3, 0, 7])
#print A
```

[-4 0 10]
[0 -2 0]
[-3 0 7]

```
#a) A~y where ~y is the column vector ~y = (.4,.1,.5)T(note:  “”T \
   means “”transpose here).

y = matrix(3,1,[0.4, 0.1, 0.5])

print 'A*y = ', A*y
```

A*y = [3.40000000000000]
[-0.200000000000000]
[2.30000000000000]

```
#b) A^5
print 'A^5 = ', A^5
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A^5 = [-154   0 310]
[0 -32   0]
[-93   0 187]

```
#c) |A|(the determinant ofA)
print 'The determinant of A is: ', A.determinant()
```

The determinant of A is: -4

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#d) eigenvalues ofA.
print 'The eigenvalue of A is: ', A.eigenvalues()
```

The eigenvalue of A is: [2, 1, -2]

```
#e) eigenvectors ofA. Print the eigenvectors in complete sentences \
    using the print command. It is not enough to simplyrun the \
    eigenvector command.  You should use what you know about \
    selecting elements and sublists from lists towrite your answers \
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    in sentences.  For example, you should write something like “The \
    eigenvector(s) correspondingto the eigenvalue ofare/is [·,·,·] \
    and [·,·,·], ”transposed.
eigenVectors = A.eigenvectors_right()
for i in eigenVectors:
     print 'The eigenvector(s) corresponding to the eigenvalue of %.f\
     and %s, transposed'%(i[0],str(i[1][0]))
```

The eigenvector(s) corresponding to the eigenvalue of 2 and (1, 0, 3/5), transposed
The eigenvector(s) corresponding to the eigenvalue of 1 and (1, 0, 1/2), transposed
The eigenvector(s) corresponding to the eigenvalue of -2 and (0, 1, 0), transposed