Problem 4: Eigenvalue finding

a) Check problem4_a.py

```
eigenvalue: 2.13307
eigenvector:
[[ 0.49742503]
 [-0.8195891 ]
 [-0.28432735]]
number of iterations: 25

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b) Check problem4_b.py

```
eigenvalue: 0.578933
eigenvector:
[[ 0.0431682 ]
 [ 0.35073145]
 [-0.9354806 ]]
number of iterations: 6

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eigenvector:
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 [ 0.35073145]
 [-0.9354806 ]]
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eigenvector:
[[ 0.0431682 ]
 [ 0.35073145]
 [-0.9354806 ]]
number of iterations: 6

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eigenvector:
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number of iterations: 6
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eigenvector:
[[0.0431682]
 [0.35073145]
 [-0.9354806]]
number of iterations: 6

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eigenvector:
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 [0.35073145]
 [-0.9354806]]
number of iterations: 6

eigenvalue: 0.578933
eigenvector:
[[0.0431682]
 [0.35073145]
 [-0.9354806]]
number of iterations: 6

c) This two method result in different eigenvalues and hence different eigenvectors in this case. And the Rayleigh quotient iteration converge much faster than the inverse iteration.

d) Check problem4_d.py

eigenvalues:

[7.28799214+0.j 2.13307448+0.j 0.57893339+0.j]

eigenvectors:

[[0.86643225 0.45305757 0.20984279]

[0.49742503 -0.8195891 -0.28432735]

[-0.0431682 -0.35073145 0.9354806]]

Inverse iteration:

relative error in eigenvalue:2.08192079078e-16

relative error in eigenvector: 1.87148797241e-13

Rayleigh quotient iteration:

relative error in eigenvalue:1.917704268e-16

relative error in eigenvector: 5.92859355033e-17

e) Check problem4_e.py

Inverse iteration:

Eigenvalue

[[2.13307448]]

Eigenvector

[[-0.49742503]

[0.8195891]

[0.28432735]]

Number of iterations 11

Rayleigh quotient iteration:

Eigenvalue

[[2.13307448]]

Eigenvector

[[0.49742503]

[-0.8195891]

[-0.28432735]]

Number of iterations 7

The output Eigenvalue are almost the same and the Eigenvector have only the difference of sign.

Rayleigh quotient iteration converge faster than Inverse iteration.