**j) Eigenvalues and Eigenvectors**

1. **Power Iteration Method:**

**Python Code:**

python

Copy code

def power\_iteration(A, num\_simulations: int):

b\_k = np.random.rand(A.shape[1])

for \_ in range(num\_simulations):

b\_k1 = np.dot(A, b\_k)

b\_k1\_norm = np.linalg.norm(b\_k1)

b\_k = b\_k1 / b\_k1\_norm

eigenvalue = np.dot(b\_k.T, np.dot(A, b\_k))

eigenvector = b\_k

return eigenvalue, eigenvector

**2. QR Algorithm:**

**Python Code:**

python

def qr\_algorithm(A, num\_iterations: int):

n = A.shape[0]

Q = np.eye(n)

R = A.copy()

for \_ in range(num\_iterations):

Q\_i, R\_i = np.linalg.qr(R)

Q = Q @ Q\_i

R = R\_i @ Q\_i

eigenvalues = np.diag(R)

return eigenvalues, Q