Common errors

P = Q Q* is a projection to span(Q) IFF Q is ORTHONORMAL!!!
 – use QR decomposition to get orthonormal basis of span(Q)

Q, R from np.linalg.qr(A) have meaningless columns/rows. You can tell the rank from here.

Array index begins with 0
array slicing does NOT include the end index. e.g. A[1:2] = A[1]

np.outer() is outer product of real numbers, use np.outer(u, np.conj(v)) for complex vectors

np.inner(u, v) omits the last axis, so the output shape will be (u.shape[:-1], v.shape[:-1])
 – example: u, v both have shape (2, 1), inner(u, v) gives shape (2, 2)

np.linalg.norm uses Frobenius norm on matrices by default
 – but if you add argument axis = 0, it will return a 1D array of norms of columns. And if axis = 1, norms of rows will be returned.
 – norm(A, 2) gives 2-norm, and norm(A, -2) gives smallest singular value of A

operator norms and ranks in NumPy are all computed by SVD(singular value decomposition), so may not work perfectly for matrices with large condition number.

do not add a column vector, shape (n, 1), with an 1-D array, shape(n,)
 – broadcasting will be used and you get (n, n) matrix.

rank of upper/lower triangular matrices are NOT just number of non-zero entries on diagonal

pytest discovery error:
 – if your pytest file imports xxx.py, do NOT write codes other than defining functions in xxx.py.
 – check punctuations, spelling, closure of brackets (usually compiler level errors)