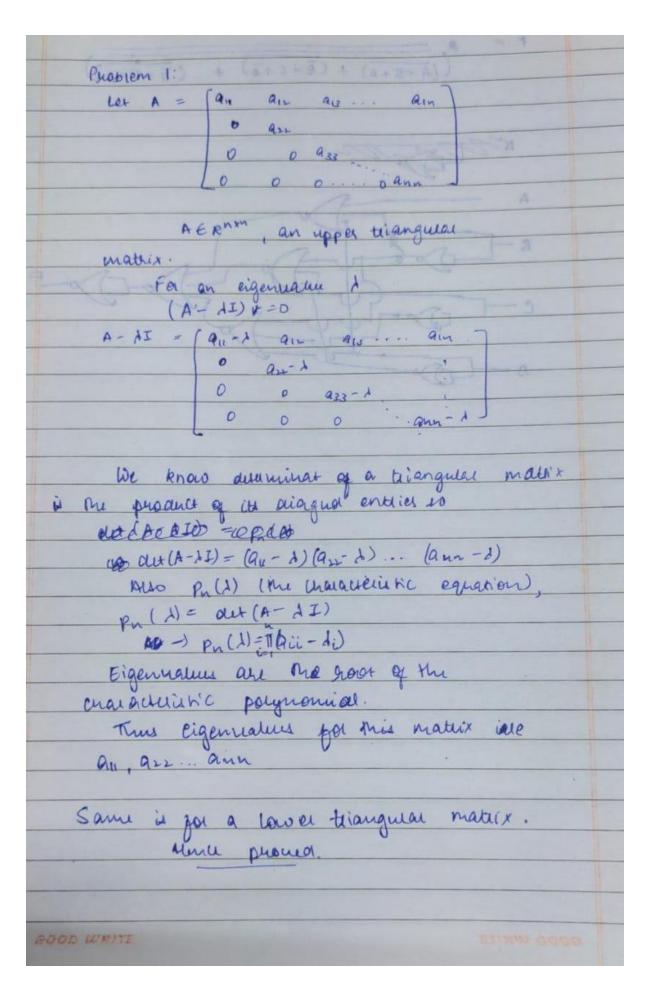
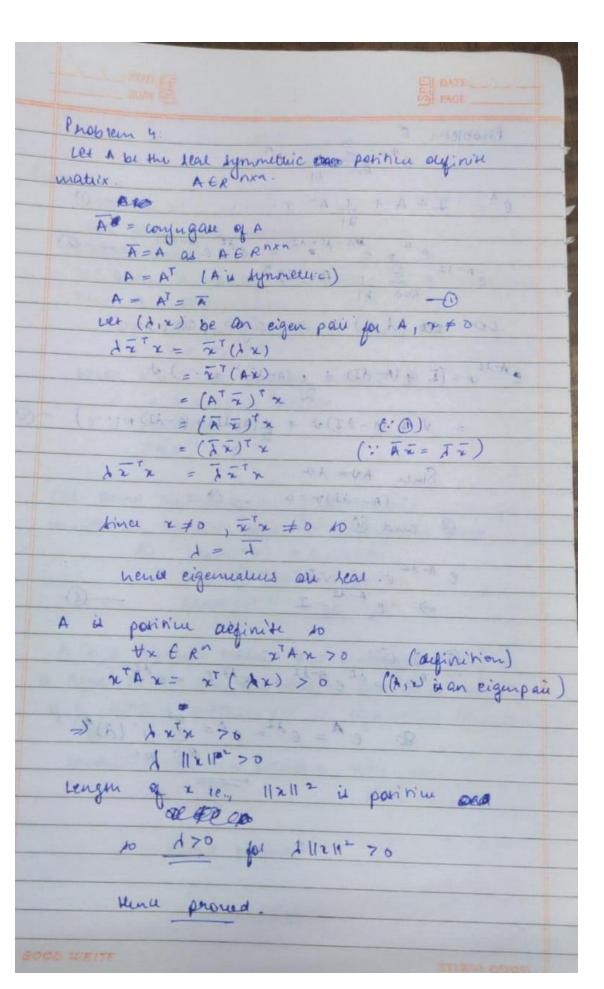
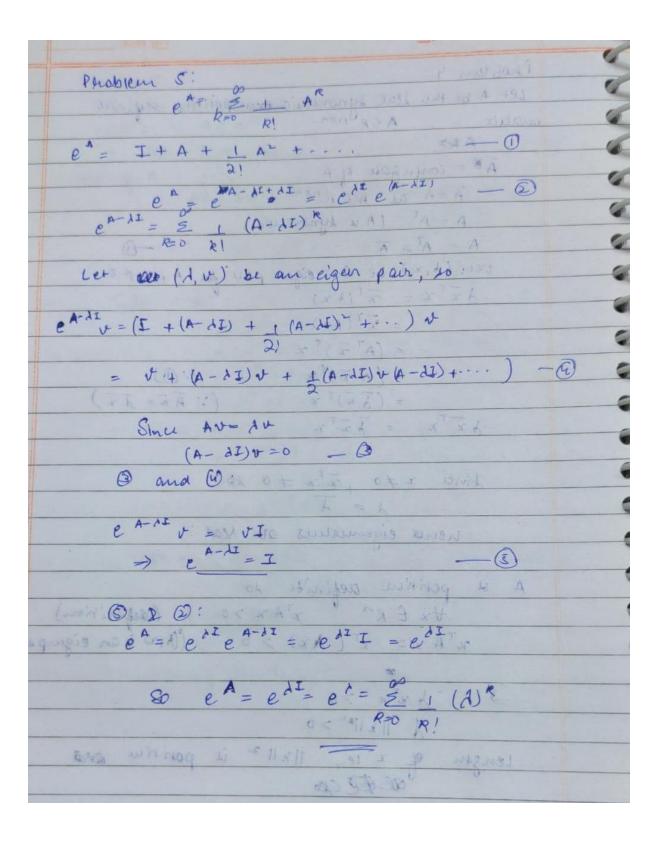
## Homework-3 Navidha Jain 2020223



-		Phoblem 2:	
	-	We know A is usonage chiec.	
		The care com	
		We know a manayechin matrix is ai agnorable	
-		mus A u alognolyable.	
_		Since it is aiagnolisable,	
		A = XAX	
		Where x is a non singular materix &	
-		1 à a aiagnol mateix	
_		X is invertible to	STEE STEE
		$XAX^{-1} = \Lambda$	
	4		100 mg
_	N HO	we know multiplication of and mathix with an	
_		invulsable materia does not change its lank.	
	-	At lang(AX) = lank(A)	
	1	$lank(x^{-1}Ax) = lank(A)$	
		lane (1) = lane (A)	
	1		
		A is a diagnol matrix and lank of a diagnol	
	i	canal to the was zero entitle and the antity	
		egnal to the non zero entires and the entires	1
		of a diagnol materix are its eigenvalues (Problem )	)
1		, BD	
1		lank (A) = non zero entri el = non zero	
11		in 1 eigen natur	
		then a promed	
			-

Phoblem 3: Claim: A= uv is a lank matrix Purple: UERM VERM The product unt min be a matrix & Rury containing multiples of u, with the multipliels as the elements of it. Since un has all columns que in lank = 1 Thus & lank (A) = lank (407)=1 A - Harritical designer Using the result of puroblem 2 since lank(a) = 1 the number of non-zero eigenvalues is also 1. Since U € wi(A) and will is I dimentional a must be an aigenmenter.  $Au = (uv^Th = u(u^Tv) = (v^Tu)u$ it is a constant and also the mon-zero eigenvalue of Am 1 Since to aim ( col (A))=1 , new (A)= no 1 where A ERMA to o a an eigenvalue with multiplicity n-1. => Eigennahus q A => viu, o. Column space of A=cev à 1- dimensional and spanned by a . Thus the power netwood finds the eigenvectoreigenralin pain in one step.





```
Problem 6:
Power Method:
Largest Eigenvalue (magnitude) is 11.0
eigenvector is
[[0.5]]
[1.]
[0.75]]
Inverse Power Method:
Smallest Eigenvalue (magnitude) is 1.99999999999996
eigenvector is
[[-0.2]
[-0.4]
[1.]]
According to the library:
Eigenvalues are [11. -2. -3.]
eigenvectors are
[[ 3.71390676e-01 1.82574186e-01 2.17732649e-17]
[7.42781353e-01 3.65148372e-01 -5.54700196e-01]
[5.57086015e-01 -9.12870929e-01 8.32050294e-01]]
Problem 7:
Shifted inverse method:
Eigenvalue closest to 2: 2.133074475348525
eigenvector is
[[-0.60692002]
[ 1.
      ]
[ 0.34691451]]
According to the library
Eigenvalues are [7.28799214 2.13307448 0.57893339]
Eigenvectors are
[ 0.45305757 -0.8195891 -0.35073145]
[ 0.20984279 -0.28432735  0.9354806 ]]
Problem 8:
convergence rate for 1 th iteration is -2.0105113838524735
convergence rate for 2 th iteration is 0.23830609100914138
convergence rate for 3 th iteration is 0.34811990082400446
convergence rate for 4th iteration is 0.4336109012595084
convergence rate for 5 th iteration is 0.5883847596701156
convergence rate for 6 th iteration is 1.0
convergence rate for 7 th iteration is 1.0
convergence rate for 8 th iteration is 1.0
convergence rate for 9 th iteration is 1.0
```

```
rayleigh quotient iteration: eigenvalue: 11.0 eigenvector: [[0.5] [1.] [0.75]]
```

According to the library, 11. was the largest eigenvalue and we have obtained 11.0 eigenvalue out of the iteration.

## Problem 9:

```
qr iteration matrix(Ak) for matrix in problem 6 is
```

```
[[11. 0.72199487 -6.18642278]
[ 0. -3. -3.8996021 ]
[ 0. 0. -2. ]]
```

```
qr iteration matrix(Ak) for matrix in problem 7 is [[ 7.28799214e+00 5.53782393e-16 -1.20642700e-16] [ 0.00000000e+00 2.13307448e+00 1.34800587e-16] [ 0.00000000e+00 0.00000000e+00 5.78933386e-01]]
```