Acheev Bhagat

MATLAB 3

Problem 1

AREF =

1.0000	0	0	-0.0105	0.0105
0	1.0000	0	2.0526	-1.0526
0	0	1.0000	2.8105	-1.8105
0	0	0	0	0

w is in the column space of A because AREF is consistent where AREF is the reduced echelon matrix built from A augmented by w. w is not in the null space of A because ANUL is not the zero vector where ANUL is A multiplied by w.

Problem 2

A =

191319	120919	411515	19451	216746	-165597	339262	340134
423715	166831	628660	557032	-60931	241318	105547	334183
-1163317	-821749	-1603066	-1180627	-263162	-902080	-860482	-1004395
-417088	-164248	-727651	-405012	-84818	-5861	-271346	-464635
238633	137581	452209	123258	167483	-75715	301553	339370
392109	413485	436751	342693	173846	516251	415866	299544

ARANK =

3

ANUL =

-0.6711	0.5627	0.1069	0.2326	-0.0492
0.6318	0.5444	-0.1161	0.1749	-0.1767
0.0674	-0.3308	-0.4223	0.0674	-0.4531
0.2503	-0.0221	0.5958	-0.3681	0.0187
-0.1777	0.1203	-0.0285	-0.8076	-0.2119

-0.1951	-0.3214	-0.3236	-0.0654	0.1343
-0.0363	-0.3956	0.5375	0.3299	0.0027
0.1114	0.0528	-0.2176	-0.0999	0.8353

ANULRANK =

5

AxANUL =

6.1863e-10

ANUL vectors are indeed in the null space because when multiplied back with A the results are 0. In addition, they are linearly independent because their rank is 5.

Problem 3

F =

8	4	-1	6	-1
9	5	-4	8	4
-3	1	-9	4	11
-6	-4	6	-7	-8
0	4	-7	10	-7

FREF =

1.0000	0	0	-0.5000	3.0000
0	1.0000	0	2.5000	-7.0000
0	0	1.0000	0	-3.0000
0	0	0	0	0
0	0	0	0	0

The first three columns are F are independent, so they would form the basis of the space spanned by the vectors.

Problem 4

A =

[]

A =

1.0000	0.8415	-0.4161	0.4546

A =

1.0000	0.8415	-0.4161	0.4546
2.0000	0.9093	-0.6536	-0.3784

A =

1.0000	0.8415	-0.4161	0.4546
2.0000	0.9093	-0.6536	-0.3784
3.0000	0.1411	0.9602	-0.1397

A =

1.0000	0.8415	-0.4161	0.4546
2.0000	0.9093	-0.6536	-0.3784
3.0000	0.1411	0.9602	-0.1397
4.0000	-0.7568	-0.1455	0.4947

detA =

-6.0242

The set of functions is linearly independent because its determinant is not 0.

Problem 5

rankA =

3

The coefficients of the polynomials don't result in a rank of 4 so the polynomials don't form the basis of P3.

Problem 6

ans =

0.5213	0.2095	0.3998
0.0626	0.3744	0.0626
0.4161	0.4161	0.5377

ans =

0.4512	0.3540	0.4365
0.0821	0.1793	0.0821
0.4667	0.4667	0.4815

ans =

0.4390	0.4087	0.4372
0.0882	0.1185	0.0882
0.4728	0.4728	0.4746

ans =

0.4364	0.4269	0.4362
0.0900	0.0995	0.0900
0.4736	0.4736	0.4738

ans =

0.4357	0.4327	0.4357
0.0906	0.0936	0.0906
0.4737	0.4737	0.4737

ans =

0.4355	0.4346	0.4355
0.0908	0.0917	0.0908
0.4737	0.4737	0.4737

ans =

0.4354	0.4351	0.4354
0.0909	0.0912	0.0909

0.4737 0.4737 0.4737

ans =

0.4354 0.4353 0.4354

0.0909 0.0910 0.0909

0.4737 0.4737 0.4737

ans =

0.4354 0.4354 0.4354

0.0909 0.0909 0.0909

0.4737 0.4737 0.4737

ans =

0.4354 0.4354 0.4354

0.0909 0.0909 0.0909

0.4737 0.4737 0.4737

Every time Q is raised to the power of 10, each row approaches a different value. Row 1 approaches 0.4354, Row 2 approached 0.0909, and Row 3 approaches 0.4737. Therefore, as *k* approaches infinity each row of the system will approach 0.4354, 0.0909, and 0.4737. The steady-state vector *p* for this system is

P =

0.6701

0.1399

0.7290