

MAT343 LAB2

Question 1

(a)

```
A = floor(25*rand(700));
z = ones(700,1);
b = A*z;
% i)
tic, x = A\b; toc % faster method
tic, y = inv(A)*b; toc
% ii)
sum(abs(x-z)) % more accurate
sum(abs(y-z))
% (b)
A = floor(25*rand(1400));
z = ones(1400,1);
b = A*z;

tic, x = A\b; toc % faster method
tic, y = inv(A)*b; toc

sum(abs(x-z)) % more accurate
sum(abs(y-z))

A = floor(25*rand(2800));
z = ones(2800,1);
b = A*z;

tic, x = A\b; toc % faster method
tic, y = inv(A)*b; toc

sum(abs(x-z)) % more accurate
sum(abs(y-z))
% (c)
% Becuase it is in the form Ax = b, which represents the form of a
% system and z represnts the solutions of the matrix.
```

Elapsed time is 0.012382 seconds.

Elapsed time is 0.037837 seconds.

ans =

9.6421e-11

ans =

3.8133e-10

Elapsed time is 0.066118 seconds.

Elapsed time is 0.184921 seconds.

ans =

2.4958e-10

ans =

4.0292e-09

Elapsed time is 0.427589 seconds.

Elapsed time is 1.299800 seconds.

ans =

3.1270e-09

ans =

1.7511e-08

Question 2

```
n = 70 ;  
B = eye(n) - triu(ones(n),1);  
A = B'*B;  
z = ones(n,1);  
b = A*z;  
  
x = A\b;  
y = inv(A)*b;  
  
sum(abs(x - z)) % more accurate  
sum(abs(y - z))
```

Warning: Matrix is close to singular or badly scaled. Results may be inaccurate.

RCOND = 1.832605e-45.

Warning: Matrix is close to singular or badly scaled. Results may be inaccurate.

RCOND = 1.832605e-45.

ans =

0

ans =

1.5032e+27

Question 3

```
A = floor(10*rand(8));  
b = floor(20*rand(8,1))-10;  
% (a)  
x = A\b  
% (b)  
U = rref([A, b])  
% (c)  
U(:,9) - x  
% (d)  
A(:,6) = 6*A(:,3)+4*A(:,2); % There will be only one solution  
% (e)  
y = floor(20*rand(8,1)) - 10;  
c = A*y; % The matrix was created to have at least one solution.  
% (f)  
U = rref([A,c]) % since one column has two nonzero numbers, there is two solutions.
```

x =

```
-26.0620  
-26.4628  
-16.2576  
25.3592  
8.1813  
4.8865  
32.9095  
18.2961
```

U =

Columns 1 through 7

```
1.0000    0    0    0    0    0    0  
0    1.0000    0    0    0    0    0  
0    0    1.0000    0    0    0    0  
0    0    0    1.0000    0    0    0  
0    0    0    0    1.0000    0    0  
0    0    0    0    0    1.0000    0  
0    0    0    0    0    0    1.0000  
0    0    0    0    0    0    0
```

Columns 8 through 9

```
0 -26.0619  
0 -26.4630  
0 -16.2576  
0 25.3592  
0 8.1813  
0 4.8864  
0 32.9095
```

1.0000 18.2963

ans =

1.0e-03 *

0.0274
-0.1476
0.0604
-0.0064
0.0116
-0.0905
-0.0082
0.1476

U =

1	0	0	0	0	0	0	0	6
0	1	0	0	0	4	0	0	25
0	0	1	0	0	6	0	0	34
0	0	0	1	0	0	0	0	4
0	0	0	0	1	0	0	0	-1
0	0	0	0	0	0	1	0	-10
0	0	0	0	0	0	0	1	5
0	0	0	0	0	0	0	0	0

Question 4

```
A = rand(3,6)
x = rand(6,1)
myrowproduct(A,x)
A*x
```

```
A = rand(5,5)
x = rand(5,1)
myrowproduct(A,x)
A*x
```

```
A = rand(5,5)
x = rand(1,5)
myrowproduct(A,x)
% A*x
```

A =

0.0562	0.5951	0.1654	0.1726	0.9024	0.4780
0.5454	0.0069	0.4035	0.5399	0.6674	0.6612
0.2065	0.7154	0.1879	0.7312	0.4582	0.8154

x =

0.0499
0.3753
0.0235
0.4966
0.7322
0.2296

ans =

1.0863
0.9479
1.1691

ans =

1.0863
0.9479
1.1691

A =

0.8962	0.3589	0.3936	0.7223	0.7318
0.5376	0.9732	0.7183	0.1977	0.4415
0.0578	0.0022	0.4343	0.5687	0.7880
0.3327	0.8186	0.4398	0.1719	0.5655
0.9051	0.1835	0.1583	0.6504	0.2386

x =

0.3257
0.8011
0.4895
0.8984
0.4244

ans =

1.7315
1.6712
1.0784
1.3739
1.2048

ans =

1.7315
1.6712
1.0784
1.3739
1.2048

A =

0.7188	0.1689	0.7811	0.0686	0.4967
0.5349	0.7589	0.5641	0.6724	0.6331
0.8400	0.5316	0.8256	0.3038	0.2877
0.7440	0.5786	0.2336	0.2023	0.8816
0.1632	0.5971	0.1835	0.9857	0.3443

x =

0.2422	0.9956	0.2772	0.4581	0.3144
--------	--------	--------	--------	--------

Dimensions do not match

ans =

[]

Question 5

(a)

```
A = rand(2,2)
B = rand(2,5)
columnproduct(A,B)
A*B

A = rand(4,4)
B = rand(4,3)
columnproduct(A,B)
A*B

A = rand(4,4)
B = rand(3,4)
columnproduct(A,B)
% A*B
% (b)
A = rand(2,2)
B = rand(2,5)
rowproduct(A,B)
A*B

A = rand(4,4)
B = rand(4,3)
rowproduct(A,B)
```

A*B

```
A = rand(4,4)
B = rand(3,4)
rowproduct(A,B)
% A*B
```

A =

0.5247	0.0923
0.9380	0.0460

B =

0.3373	0.5621	0.9720	0.9757	0.9568
0.1343	0.7674	0.1501	0.7742	0.2226

ans =

0.1894	0.3658	0.5239	0.5834	0.5226
0.3226	0.5625	0.9186	0.9508	0.9077

ans =

0.1894	0.3658	0.5239	0.5834	0.5226
0.3226	0.5625	0.9186	0.9508	0.9077

A =

0.4939	0.6360	0.3380	0.5993
0.6504	0.1173	0.4200	0.2843
0.0702	0.9263	0.1968	0.6314
0.8852	0.2119	0.3461	0.7677

B =

0.7542	0.8356	0.8898
0.9171	0.4929	0.0343
0.0071	0.2570	0.3590
0.3210	0.3277	0.9434

ans =

1.1505	1.0094	1.1480
0.6923	0.8024	1.0017
1.1066	0.7727	0.7606

1.1108	1.1846	1.6434
--------	--------	--------

ans =

1.1505	1.0094	1.1480
0.6923	0.8024	1.0017
1.1066	0.7727	0.7606
1.1108	1.1846	1.6434

A =

0.5427	0.9326	0.1077	0.3212
0.6006	0.6461	0.6564	0.0482
0.6425	0.2126	0.4271	0.7391
0.2635	0.4715	0.4213	0.9387

B =

0.5152	0.0050	0.7414	0.2619
0.7541	0.3520	0.5374	0.4332
0.2500	0.2725	0.4865	0.4192

Dimensions do not match

ans =

[]

A =

0.9116	0.1511
0.9881	0.3548

B =

0.2009	0.2132	0.6019	0.5811	0.4376
0.1040	0.1617	0.5495	0.7618	0.3020

ans =

0.1988	0.2188	0.6317	0.6448	0.4446
0.2354	0.2680	0.7897	0.8444	0.5396

ans =

0.1988	0.2188	0.6317	0.6448	0.4446
0.2354	0.2680	0.7897	0.8444	0.5396

A =

0.4531	0.0126	0.6804	0.2597
0.7233	0.8926	0.2872	0.4410
0.2711	0.7726	0.7860	0.0295
0.0060	0.0591	0.3370	0.1714

B =

0.6717	0.5572	0.0054
0.6085	0.0014	0.0313
0.2021	0.2955	0.6425
0.1629	0.8339	0.2622

ans =

0.4919	0.6701	0.5080
1.1589	0.8569	0.3320
0.8159	0.4090	0.5384
0.1360	0.2459	0.2633

ans =

0.4919	0.6701	0.5080
1.1589	0.8569	0.3320
0.8159	0.4090	0.5384
0.1360	0.2459	0.2633

A =

0.1773	0.4356	0.1130	0.5803
0.0329	0.6474	0.7412	0.1642
0.9689	0.4589	0.4763	0.8641
0.8324	0.3450	0.7526	0.7933

B =

0.9040	0.0124	0.0107	0.3951
0.3115	0.2669	0.8613	0.9270
0.2622	0.6895	0.0464	0.8789

Dimensions do not match

ans =

[]

Functions

```
function product = myrowproduct(A,x)
[a b] = size(A);
[c d] = size(x);
product = [];

if b~=c
    disp('Dimensions do not match');
    return;
end
for index = 1:a
    product = [product;A(index,:)*x];
end

function result = columnproduct(A,B)
[a b] = size(A);
[c d] = size(B);
result = [];

if c~=b
    disp('Dimensions do not match');
    return;
end
for index = 1:d
    result(:,index) = A*B(:,index);
end

function answer = rowproduct(A,B)
[a b] = size(A);
[c d] = size(B);
answer = [];

if b~=c
    disp('Dimensions do not match');
    return;
end
for index = 1:a
    answer = [answer;A(index,:)*B];
end
```