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```
A = [2 1 4 9 6; 7 1 0 5 -1; 32 0 1 0 3; -2 0 1 22 -2; -51 0 0 -3 4]; %  
Set A  
B = [13; 5; 68; 17; -6]; % Set B
```

Problem 1

```
detA = det(A); % Determinant of A  
invA = inv(A); % Inverse of A  
detinvA = det(invA)  
det1A = 1 / detA % Proving equality  
% Matrix A is invertible because it has a determinant not equal to 0
```

```
detinvA =  
  
-7.0102e-05
```

```
det1A =  
  
-7.0102e-05
```

Problem 2

```
A1 = A + 1; % New matrix of A + 1  
det(A) * det(A1)  
det(A * A1) % Proving equality
```

```
ans =  
  
2.7385e+08
```

```
ans =  
  
2.7385e+08
```

Problem 3

```
invA = inv(A); % Calling invA again  
invA * A  
A * invA % Proving equality to I
```

```
ans =  
  
1.0000         0 -0.0000         0         0  
-0.0000  1.0000 -0.0000 -0.0000  0.0000  
         0         0  1.0000 -0.0000  0.0000  
0.0000         0  0.0000  1.0000 -0.0000  
         0         0  0.0000         0  1.0000
```

```
ans =  
  
1.0000  0.0000  0.0000 -0.0000  0.0000  
         0  1.0000         0 -0.0000         0  
         0         0  1.0000 -0.0000  0.0000  
-0.0000  0.0000         0  1.0000 -0.0000  
0.0000 -0.0000         0 -0.0000  1.0000
```

Problem 4

```
I = eye(5); % Identity matrix 5x5  
AI = [A,I]; % Creating matrix [A, I]  
rref(AI)  
IinvA = [I,invA] % Proving equality
```

```
ans =  
  
Columns 1 through 7  
  
1.0000         0         0         0         0 -0.0051  0.0051  
         0  1.0000         0         0         0  0.0871  0.9129  
         0         0  1.0000         0         0  0.4212 -0.4212  
         0         0         0  1.0000         0 -0.0274  0.0274  
         0         0         0         0  1.0000 -0.0858  0.0858  
  
Columns 8 through 10  
  
0.0204  0.0001 -0.0063  
-0.1142 -0.2341  0.0662  
-0.5556 -0.1291 -0.3849
```

0.0545	0.0552	0.0347
0.3009	0.0423	0.1956

*I*invA =

Columns 1 through 7

1.0000	0	0	0	0	-0.0051	0.0051
0	1.0000	0	0	0	0.0871	0.9129
0	0	1.0000	0	0	0.4212	-0.4212
0	0	0	1.0000	0	-0.0274	0.0274
0	0	0	0	1.0000	-0.0858	0.0858

Columns 8 through 10

0.0204	0.0001	-0.0063
-0.1142	-0.2341	0.0662
-0.5556	-0.1291	-0.3849
0.0545	0.0552	0.0347
0.3009	0.0423	0.1956

Problem 5

```
augAB = [A,B] % Setting AB
% vv Doing RREF manually with Gauss-Jordan Elimination vv
augAB(4,:) = augAB(4,:) + augAB(1,:)
augAB(3,:) = augAB(3,:) - 16 * augAB(1,:)
augAB(5,:) = augAB(5,:) + 7 * augAB(2,:)
augAB(5,:) = augAB(5,:) + augAB(1,:)
augAB(1,:) = 0.5 * augAB(1,:)
augAB(2,:) = augAB(2,:) - 7 * augAB(1,:)
augAB(5,:) = augAB(5,:) - 8 * augAB(4,:)
augAB(3,:) = augAB(3,:) + 16 * augAB(4,:)
augAB(2,:) = augAB(2,:) + 2.5 * augAB(4,:)
augAB(2,:) = augAB(2,:) / -1.5
augAB(3,:) = augAB(3,:) - 17 * augAB(2,:)
augAB(5,:) = augAB(5,:) + 36 * augAB(2,:)
augAB(3,:) = augAB(3,:) / 930
augAB(5,:) = augAB(5,:) / -1431
augAB(5,:) = augAB(5,:) - augAB(3,:)
augAB(5,:) = augAB(5,:) / (augAB(5,5))
augAB(1,:) = augAB(1,:) - 0.5 * augAB(4,:)
augAB(1,:) = augAB(1,:) + 0.5 * augAB(2,:)
augAB(4,:) = augAB(4,:) - 5 * augAB(2,:)
augAB(1,:) = augAB(1,:) + 28 * augAB(3,:)
augAB(2,:) = augAB(2,:) + 34 * augAB(3,:)
augAB(4,:) = augAB(4,:) - 201 * augAB(3,:)
augAB(1,:) = augAB(1,:) - augAB(1,5) * augAB(5,:)
augAB(2,:) = augAB(2,:) - augAB(2,5) * augAB(5,:)
augAB(3,:) = augAB(3,:) - augAB(3,5) * augAB(5,:)
augAB(4,:) = augAB(4,:) - augAB(4,5) * augAB(5,:)
```

$\text{augAB} =$

2	1	4	9	6	13
7	1	0	5	-1	5
32	0	1	0	3	68
-2	0	1	22	-2	17
-51	0	0	-3	4	-6

$\text{augAB} =$

2	1	4	9	6	13
7	1	0	5	-1	5
32	0	1	0	3	68
0	1	5	31	4	30
-51	0	0	-3	4	-6

$\text{augAB} =$

2	1	4	9	6	13
7	1	0	5	-1	5
0	-16	-63	-144	-93	-140
0	1	5	31	4	30
-51	0	0	-3	4	-6

$\text{augAB} =$

2	1	4	9	6	13
7	1	0	5	-1	5
0	-16	-63	-144	-93	-140
0	1	5	31	4	30
-2	7	0	32	-3	29

$\text{augAB} =$

2	1	4	9	6	13
7	1	0	5	-1	5
0	-16	-63	-144	-93	-140
0	1	5	31	4	30
0	8	4	41	3	42

$\text{augAB} =$

1.0000	0.5000	2.0000	4.5000	3.0000	6.5000
7.0000	1.0000	0	5.0000	-1.0000	5.0000
0	-16.0000	-63.0000	-144.0000	-93.0000	-140.0000
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	8.0000	4.0000	41.0000	3.0000	42.0000

augAB =

1.0000	0.5000	2.0000	4.5000	3.0000	6.5000
0	-2.5000	-14.0000	-26.5000	-22.0000	-40.5000
0	-16.0000	-63.0000	-144.0000	-93.0000	-140.0000
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	8.0000	4.0000	41.0000	3.0000	42.0000

augAB =

1.0000	0.5000	2.0000	4.5000	3.0000	6.5000
0	-2.5000	-14.0000	-26.5000	-22.0000	-40.5000
0	-16.0000	-63.0000	-144.0000	-93.0000	-140.0000
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	0	-36.0000	-207.0000	-29.0000	-198.0000

augAB =

1.0000	0.5000	2.0000	4.5000	3.0000	6.5000
0	-2.5000	-14.0000	-26.5000	-22.0000	-40.5000
0	0	17.0000	352.0000	-29.0000	340.0000
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	0	-36.0000	-207.0000	-29.0000	-198.0000

augAB =

1.0000	0.5000	2.0000	4.5000	3.0000	6.5000
0	0	-1.5000	51.0000	-12.0000	34.5000
0	0	17.0000	352.0000	-29.0000	340.0000
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	0	-36.0000	-207.0000	-29.0000	-198.0000

augAB =

1.0000	0.5000	2.0000	4.5000	3.0000	6.5000
0	0	1.0000	-34.0000	8.0000	-23.0000
0	0	17.0000	352.0000	-29.0000	340.0000
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	0	-36.0000	-207.0000	-29.0000	-198.0000

augAB =

1.0000	0.5000	2.0000	4.5000	3.0000	6.5000
0	0	1.0000	-34.0000	8.0000	-23.0000
0	0	0	930.0000	-165.0000	731.0000
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	0	-36.0000	-207.0000	-29.0000	-198.0000

augAB =

1.0e+03 *

0.0010	0.0005	0.0020	0.0045	0.0030	0.0065
0	0	0.0010	-0.0340	0.0080	-0.0230
0	0	0	0.9300	-0.1650	0.7310
0	0.0010	0.0050	0.0310	0.0040	0.0300
0	0	0	-1.4310	0.2590	-1.0260

augAB =

1.0e+03 *

0.0010	0.0005	0.0020	0.0045	0.0030	0.0065
0	0	0.0010	-0.0340	0.0080	-0.0230
0	0	0	0.0010	-0.0002	0.0008
0	0.0010	0.0050	0.0310	0.0040	0.0300
0	0	0	-1.4310	0.2590	-1.0260

augAB =

1.0000	0.5000	2.0000	4.5000	3.0000	6.5000
0	0	1.0000	-34.0000	8.0000	-23.0000
0	0	0	1.0000	-0.1774	0.7860
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	0	0	1.0000	-0.1810	0.7170

augAB =

1.0000	0.5000	2.0000	4.5000	3.0000	6.5000
0	0	1.0000	-34.0000	8.0000	-23.0000
0	0	0	1.0000	-0.1774	0.7860
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	0	0	0	-0.0036	-0.0690

augAB =

1.0000	0.5000	2.0000	4.5000	3.0000	6.5000
0	0	1.0000	-34.0000	8.0000	-23.0000
0	0	0	1.0000	-0.1774	0.7860
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	0	0	0	1.0000	19.3230

augAB =

1.0000	0	-0.5000	-11.0000	1.0000	-8.5000
0	0	1.0000	-34.0000	8.0000	-23.0000

0	0	0	1.0000	-0.1774	0.7860
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	0	0	0	1.0000	19.3230

augAB =

1.0000	0	0	-28.0000	5.0000	-20.0000
0	0	1.0000	-34.0000	8.0000	-23.0000
0	0	0	1.0000	-0.1774	0.7860
0	1.0000	5.0000	31.0000	4.0000	30.0000
0	0	0	0	1.0000	19.3230

augAB =

1.0000	0	0	-28.0000	5.0000	-20.0000
0	0	1.0000	-34.0000	8.0000	-23.0000
0	0	0	1.0000	-0.1774	0.7860
0	1.0000	0	201.0000	-36.0000	145.0000
0	0	0	0	1.0000	19.3230

augAB =

1.0000	0	0	0	0.0323	2.0086
0	0	1.0000	-34.0000	8.0000	-23.0000
0	0	0	1.0000	-0.1774	0.7860
0	1.0000	0	201.0000	-36.0000	145.0000
0	0	0	0	1.0000	19.3230

augAB =

1.0000	0	0	0	0.0323	2.0086
0	0	1.0000	0	1.9677	3.7247
0	0	0	1.0000	-0.1774	0.7860
0	1.0000	0	201.0000	-36.0000	145.0000
0	0	0	0	1.0000	19.3230

augAB =

1.0000	0	0	0	0.0323	2.0086
0	0	1.0000	0	1.9677	3.7247
0	0	0	1.0000	-0.1774	0.7860
0	1.0000	0	0	-0.3387	-12.9903
0	0	0	0	1.0000	19.3230

augAB =

1.0000	0	0	0	0	1.3853
0	0	1.0000	0	1.9677	3.7247

```

0      0      0      1.0000      -0.1774      0.7860
0      1.0000      0      0      -0.3387      -12.9903
0      0      0      0      1.0000      19.3230

```

```
augAB =
```

```

1.0000      0      0      0      0      1.3853
0      0      1.0000      0      0      -34.2980
0      0      0      1.0000      -0.1774      0.7860
0      1.0000      0      0      -0.3387      -12.9903
0      0      0      0      1.0000      19.3230

```

```
augAB =
```

```

1.0000      0      0      0      0      1.3853
0      0      1.0000      0      0      -34.2980
0      0      0      1.0000      0      4.2143
0      1.0000      0      0      -0.3387      -12.9903
0      0      0      0      1.0000      19.3230

```

```
augAB =
```

```

1.0000      0      0      0      0      1.3853
0      0      1.0000      0      0      -34.2980
0      0      0      1.0000      0      4.2143
0      1.0000      0      0      0      -6.4454
0      0      0      0      1.0000      19.3230

```

^^ Doing RREF manually with Gauss-Jordan Elimination ^^

```

% Reorganizing matrix to RREF form
solrref = [augAB(1,:); augAB(4,:); augAB(2,:); augAB(3,:); augAB(5,:)]
rrefAB = rref(augAB) % Proving equality

```

```
solrref =
```

```

1.0000      0      0      0      0      1.3853
0      1.0000      0      0      0      -6.4454
0      0      1.0000      0      0      -34.2980
0      0      0      1.0000      0      4.2143
0      0      0      0      1.0000      19.3230

```

```
rrefAB =
```

```

1.0000      0      0      0      0      1.3853

```

0	1.0000	0	0	0	-6.4454
0	0	1.0000	0	0	-34.2980
0	0	0	1.0000	0	4.2143
0	0	0	0	1.0000	19.3230

Problem 6

Doing Cramer's rule 5 times for x1, x2, x3, x4, x5

```

Ax1 = A; % setting Ax1
Ax1(:,1) = B; % replacing column 1 of Ax1
x1 = det(Ax1) / det(A); % solving for x1

Ax2 = A;
Ax2(:,2) = B;
x2 = det(Ax2) / det(A);

Ax3 = A;
Ax3(:,3) = B;
x3 = det(Ax3) / det(A);

Ax4 = A;
Ax4(:,4) = B;
x4 = det(Ax4) / det(A);

Ax5 = A;
Ax5(:,5) = B;
x5 = det(Ax5) / det(A);

solcramer = [x1; x2; x3; x4; x5] % Reorganizing matrix solution
rrefAB(:,6) % Proving equality

solcramer =

    1.3853
   -6.4454
  -34.2980
    4.2143
   19.3230

ans =

    1.3853
   -6.4454
  -34.2980
    4.2143
   19.3230

```

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