ME 318M Homework #7

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Section Number: 17460

Problem 1:

Code:

```
function I = inverse2(M)
[rows, columns] = size(M); %check if input matrix is a square matrix
if rows ~= columns %if not square, end function/script
    disp('Input matrix is not a square matrix')
    I = [];
    return
end
%make an identity matrix, a, that is same size as the input matrix
for j = 1:columns
    for i = 1:rows
        if i == j
            out(i,j) = 1;
        else
            out(i,j) = 0;
        end
    end
end
%actual math part
M = [M, out];
for k = 1:rows
    A = M(k, k:end);                    %first row
    B = A/(M(k,k));                       %first row/diag
    M(k, k:end) = B;                      %reassign first row
    C = M([1:k-1, k+1:end], k:end);                %rest of M
    factor = M([1:k-1,k+1:end],k);        %get the shit under the 1
    sub = factor*B;
    NewRest = C - sub;
    M([1:k-1, k+1:end], k:end) = NewRest;
end
I = M(1:end, rows+1:end);
```

To find if inverse found is actually inverse, I multiplied the inverse by matrix M and obtained the 20x20 identity matrix.

Command Window:

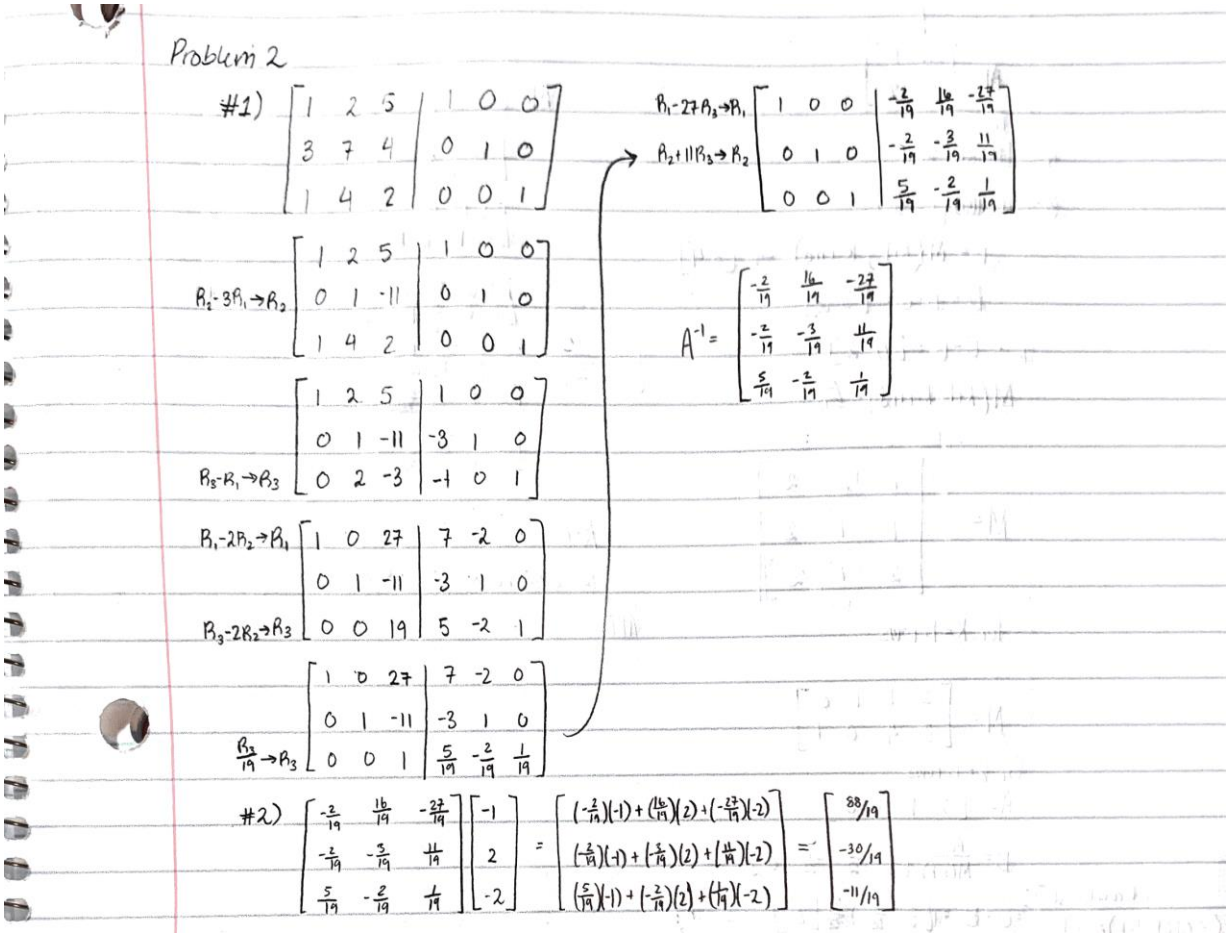
```
>> M*I

ans =

  Columns 1 through 4

    1.0000    0.0000    0.0000   -0.0000
    0.0000    1.0000   -0.0000    0.0000
    0.0000    0.0000    1.0000    0.0000
    0.0000    0.0000   -0.0000    1.0000
   -0.0000    0.0000    0.0000   -0.0000
   -0.0000   -0.0000    0.0000   -0.0000
   -0.0000   -0.0000   -0.0000   -0.0000
    0.0000    0.0000   -0.0000    0.0000
   -0.0000   -0.0000    0.0000   -0.0000
    0.0000   -0.0000    0.0000   -0.0000
    0.0000    0.0000   -0.0000    0.0000
    0.0000   -0.0000   -0.0000    0.0000
   -0.0000   -0.0000    0.0000   -0.0000
   -0.0000   -0.0000   -0.0000    0.0000
   -0.0000   -0.0000    0.0000   -0.0000
   -0.0000   -0.0000    0.0000   -0.0000
   -0.0000   -0.0000    0.0000   -0.0000
   -0.0000   -0.0000    0.0000   -0.0000
   -0.0000   -0.0000    0.0000   -0.0000
   -0.0000    0.0000    0.0000   -0.0000

  Columns 5 through 8

   -0.0000    0.0000    0.0000   -0.0000
   -0.0000    0.0000    0.0000   -0.0000
   -0.0000    0.0000   -0.0000   -0.0000
   -0.0000   -0.0000    0.0000    0.0000
    1.0000    0.0000    0.0000    0.0000
    0.0000    1.0000    0.0000    0.0000
    0.0000   -0.0000    1.0000   -0.0000
   -0.0000    0.0000   -0.0000    1.0000
    0.0000   -0.0000    0.0000    0.0000
    0.0000   -0.0000    0.0000    0.0000
   -0.0000    0.0000    0.0000    0.0000
   -0.0000    0.0000   -0.0000   -0.0000
    0.0000   -0.0000    0.0000    0.0000
    0.0000   -0.0000   -0.0000   -0.0000
    0.0000   -0.0000    0.0000    0.0000
    0.0000   -0.0000   -0.0000    0.0000
    0.0000   -0.0000    0.0000    0.0000
    0.0000   -0.0000    0.0000    0.0000
    0.0000   -0.0000   -0.0000   -0.0000
    0.0000    0.0000    0.0000    0.0000

  Columns 9 through 12
```

```
  0.0000    0.0000   -0.0000   -0.0000
 -0.0000    0.0000    0.0000   -0.0000
 -0.0000    0.0000    0.0000   -0.0000
  0.0000   -0.0000    0.0000   -0.0000
  0.0000    0.0000   -0.0000    0.0000
  0.0000   -0.0000   -0.0000    0.0000
  0.0000   -0.0000   -0.0000    0.0000
 -0.0000    0.0000    0.0000   -0.0000
  1.0000   -0.0000   -0.0000    0.0000
  0.0000    1.0000   -0.0000    0.0000
 -0.0000    0.0000    1.0000   -0.0000
 -0.0000    0.0000    0.0000    1.0000
  0.0000   -0.0000   -0.0000    0.0000
  0.0000   -0.0000   -0.0000    0.0000
  0.0000    0.0000   -0.0000    0.0000
  0.0000   -0.0000   -0.0000    0.0000
  0.0000   -0.0000   -0.0000    0.0000
  0.0000   -0.0000   -0.0000    0.0000
  0.0000   -0.0000   -0.0000    0.0000
  0.0000    0.0000   -0.0000    0.0000

Columns 13 through 16

 -0.0000    0.0000    0.0000   -0.0000
 -0.0000   -0.0000    0.0000   -0.0000
 -0.0000    0.0000    0.0000   -0.0000
  0.0000   -0.0000   -0.0000   -0.0000
  0.0000   -0.0000   -0.0000    0.0000
  0.0000    0.0000   -0.0000    0.0000
 -0.0000    0.0000    0.0000    0.0000
 -0.0000    0.0000    0.0000   -0.0000
  0.0000   -0.0000   -0.0000    0.0000
  0.0000   -0.0000   -0.0000    0.0000
  0.0000   -0.0000    0.0000   -0.0000
 -0.0000    0.0000    0.0000   -0.0000
  1.0000   -0.0000   -0.0000    0.0000
 -0.0000    1.0000   -0.0000    0.0000
  0.0000   -0.0000    1.0000    0.0000
  0.0000   -0.0000   -0.0000    1.0000
  0.0000    0.0000   -0.0000    0.0000
  0.0000   -0.0000   -0.0000    0.0000
 -0.0000    0.0000    0.0000    0.0000
  0.0000   -0.0000   -0.0000    0.0000

Columns 17 through 20

  0.0000    0.0000    0.0000    0.0000
 -0.0000    0.0000    0.0000    0.0000
 -0.0000    0.0000    0.0000    0.0000
 -0.0000   -0.0000   -0.0000    0.0000
  0.0000   -0.0000   -0.0000   -0.0000
  0.0000   -0.0000   -0.0000   -0.0000
```

```
 0.0000    0.0000    0.0000   -0.0000
-0.0000    0.0000    0.0000    0.0000
 0.0000   -0.0000   -0.0000   -0.0000
-0.0000   -0.0000   -0.0000   -0.0000
-0.0000   -0.0000    0.0000    0.0000
-0.0000    0.0000    0.0000    0.0000
 0.0000   -0.0000   -0.0000   -0.0000
 0.0000    0.0000   -0.0000   -0.0000
 0.0000   -0.0000   -0.0000   -0.0000
 0.0000   -0.0000   -0.0000   -0.0000
 1.0000   -0.0000   -0.0000   -0.0000
 0.0000    1.0000   -0.0000   -0.0000
 0.0000    0.0000    1.0000   -0.0000
 0.0000   -0.0000   -0.0000    1.0000
```

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	-0.0471	0.1105	-0.0397	0.0800	-0.4511	-0.2751	-0.6318	-0.6245	-0.3219	-0.2665	0.2344	-0.5122	-1.5596	0.5085	0.7293	-0.5160	0.3952	0.7494	0.3951	0.1016
2	0.3848	0.1683	-0.1117	0.3348	-0.7261	0.6019	0.0261	-0.1414	-0.6172	0.7452	0.2468	-0.3748	-0.6651	0.0235	0.4068	-0.5001	-0.5168	0.3190	0.1420	0.2691
3	-0.3114	0.0734	0.1659	-0.1678	0.2808	-0.4237	-0.3603	-0.5512	-0.0972	-0.5672	0.0695	-0.1488	-0.5428	0.4356	0.3391	-0.2711	0.5667	0.3506	0.0039	-0.0208
4	-0.0340	-0.0628	0.1013	0.0486	-0.0693	-0.0685	-0.1280	-0.1726	0.0190	-0.1882	0.1107	0.0199	-0.1783	0.1892	0.0461	-0.0396	0.0279	0.1755	0.0517	0.1028
5	0.8684	-0.0307	-0.2231	0.6074	-0.7846	1.4565	0.8719	1.3296	-0.7965	1.5774	-0.1063	0.3680	1.9321	-0.9102	-0.7832	0.3807	-1.6336	-1.0001	-0.7166	0.7030
6	0.6177	0.4356	-0.3070	0.4567	-1.2441	0.7252	-0.3852	-0.5876	-1.0355	0.8282	0.6716	-0.6143	-1.4341	0.4621	0.5983	-0.8852	-0.3994	0.7767	0.2182	0.6148
7	0.9398	0.3564	-0.3166	0.7630	-1.4836	1.2166	-0.0549	0.1076	-1.3136	1.4514	0.3625	-0.5002	-0.7218	-0.0312	0.4412	-0.7121	-1.1609	0.0713	-0.1772	0.6800
8	0.4934	0.2836	-0.3541	0.6076	-1.3673	0.7788	-0.5165	-0.6683	-1.1112	0.7681	0.4573	-0.6830	-1.4289	0.5089	0.6008	-0.9078	-0.4356	0.8313	0.0872	0.6392
9	1.2760	0.3666	-0.4800	1.0163	-2.1902	1.4661	-0.5219	-0.3598	-1.6070	1.7956	0.7712	-0.8988	-1.6724	0.1512	1.0029	-1.1968	-1.1172	0.7552	0.3496	0.8083
10	-0.6411	-0.3240	0.2840	-0.4791	0.5735	-0.8284	-0.2598	-0.1376	0.6330	-0.8534	-0.1284	0.3060	-0.0296	0.0804	-0.1855	0.2559	0.9773	-0.0795	0.1701	-0.3441
11	0.8645	0.4601	-0.2757	0.6567	-1.5633	1.0832	-0.3476	-0.5878	-1.2268	1.1191	0.5490	-0.6741	-1.3870	0.2478	0.6496	-0.8565	-0.7621	0.7416	0.3348	0.5006
12	0.3144	0.1255	-0.1861	0.3142	-0.8392	0.3288	-0.5074	-0.4910	-0.6046	0.3408	0.3152	-0.4242	-1.0560	0.1953	0.3997	-0.5556	-0.2232	0.5521	0.0824	0.4387
13	-0.2436	-0.0807	0.0266	-0.3349	0.7066	-0.3771	0.3367	0.2705	0.5272	-0.5971	-0.0979	0.4147	0.8559	-0.2114	-0.3830	0.3827	0.3004	-0.2868	-0.1112	-0.2993
14	1.5164	0.2196	-0.4456	0.9097	-1.1493	2.3303	0.9830	1.7189	-1.0886	2.4713	0.0327	0.1054	1.9581	-1.2040	-0.6197	-0.1341	-2.2747	-1.0972	-0.5495	0.5642
15	-1.5003	-0.5011	0.4989	-1.3707	2.3392	-2.1070	0.0136	-0.2389	1.9838	-2.4520	-0.7375	0.7961	0.6131	0.2985	-0.5332	1.0425	1.8747	-0.2684	0.0325	-0.9723
16	-0.6166	-0.5154	0.2280	-0.5873	1.5411	-0.7582	0.6123	0.6867	1.1346	-1.0359	-0.3919	0.6209	1.7549	-0.3885	-1.0020	0.9638	0.5603	-0.9113	-0.2855	-0.5810
17	-0.2815	0.0718	0.0962	-0.4844	0.4054	-0.4101	-0.3102	-0.2306	0.2433	-0.5160	-0.1083	-0.0382	-0.3232	0.3382	0.0734	0.0034	0.3409	0.2042	-0.0242	-0.2495
18	-1.5063	-0.5493	0.6292	-1.4388	2.7448	-2.3626	0.3332	0.0987	2.3450	-2.5818	-0.8404	0.9290	1.3599	0.0682	-0.8106	1.2312	1.9373	-0.5018	0.0058	-1.2494
19	0.9318	0.4931	-0.4179	0.7519	-1.6970	1.2930	-0.2387	-0.2322	-1.3708	1.5301	0.5841	-0.7179	-1.1052	0.0657	0.7379	-0.9382	-1.1213	0.3736	0.2855	0.6152

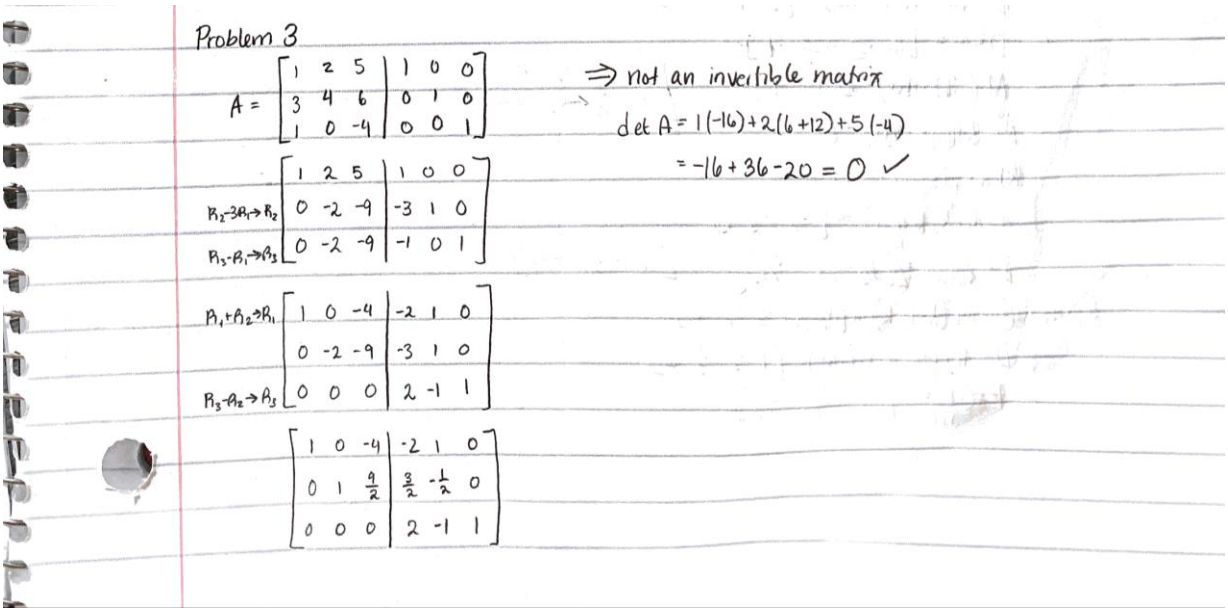
Problem 2:



3) MATLAB Command Window

```
>> A = [1 2 5; 3 7 4; 1 4 2];
>> inverse2(A)

ans =

   -0.1053    0.8421   -1.4211
   -0.1053   -0.1579    0.5789
    0.2632   -0.1053    0.0526

>> ans*[-1; 2; -2]

ans =

    4.6316
   -1.3684
   -0.5789
```

Problem 3:



Interesting MATLAB output:

```
>> A = [1 2 5; 3 4 6; 1 0 -4]

A =

     1     2     5
     3     4     6
     1     0    -4
```

While trying to find the inverse of A, the third row became all zeroes. This meant that the Gauss-Jordan method could not be completed because there was no way to change the left side to the identity matrix.