Tue. Oct. 8. 2019 2018311199

박준혁

#INPUT MATRIX

```
matA=magic(9);
```

#DETERMINANT

```
% METHOD_1:Cofactor
D_1=0;
for n=1:size(matA,2) %Iteration for nth column in 1st row
    D_1=D_1+cof(matA,n)*matA(1,n); % D=sum(cofactor*entries)
end
D_1
```

```
D_1 = 7.5036e+16
```

```
% METHOD_2:Product of diagonal entries in row echelon form(REF)
E=GE(matA)
```

```
E = 9×9

10^3 ×

    0.0470    0.0580    0.0690    0.0800    0.0010    0.0120    0.0230    0.0340    0.04
         0   -0.0023   -0.0047   -0.0880    0.0098    0.0074    0.0051    0.0028   -0.00
         0         0   -0.0810    0.0720   -0.0000   -0.0000   -0.0000   -0.0000    0.00
         0         0         0    3.2713   -0.3387   -0.2577   -0.1767   -0.1047    0.32
         0         0         0         0    0.0449    0.0535    0.0621    0.0608    0.06
         0         0         0         0         0   -0.0036   -0.0162   -0.0088   -0.09
         0         0         0         0         0         0    0.0080   -0.0800    0.07
         0         0         0         0         0   -0.0000         0   -0.2945    0.59
         0         0         0         0         0   -0.0000         0         0    6.72
```

```
D_2=prod(diag(E))
```

```
D_2 = 7.5036e+16
```

CHECK

```
det(matA)
```

```
ans = 7.5036e+16
```

```
round(det(matA)-D_1,-2)==0 % METHOD_1: 100의 자리까지 일치
```

```
ans = logical
   1
```

```
det(matA)-D_2==0 % METHOD_2: 모두 일치
```

```
ans = logical
   1
```

#INVERSE

```
% METHOD: Gauss-Jordan
augA=[matA eye(9)]
```

Junhyeok

```
augA = 9×18
    47    58    69    80     1    12    23    34    45     1     0     0     0     0
    57    68    79     9    11    22    33    44    46     0     1     0     0     0
    67    78     8    10    21    32    43    54    56     0     0     1     0     0
    77     7    18    20    31    42    53    55    66     0     0     0     1     0
     6    17    19    30    41    52    63    65    76     0     0     0     0     1
    16    27    29    40    51    62    64    75     5     0     0     0     0     0
    26    28    39    50    61    72    74     4    15     0     0     0     0     0
    36    38    49    60    71    73     3    14    25     0     0     0     0     0
    37    48    59    70    81     2    13    24    35     0     0     0     0     0
```

```
RE=GJE(augA)
```

```
RE = 9×18
    1.0000         0         0         0         0   -0.0000         0         0
         0    1.0000         0         0    0.0000   -0.0000         0         0
         0         0    1.0000         0         0   -0.0000         0   -0.0000
         0         0         0    1.0000   -0.0000   -0.0000         0         0
         0         0         0         0    1.0000   -0.0000         0         0
         0         0         0         0         0    1.0000         0         0
         0         0         0         0         0    0.0000    1.0000         0    0.00
         0         0         0         0         0   -0.0000         0    1.0000
         0         0         0         0         0   -0.0000         0         0    1.00
```

```
invA=RE(:,10:end)
```

```
invA = 9×9
    0.0005   -0.0012    0.0017    0.0126   -0.0121    0.0003    0.0003    0.0003    0.00
    0.0003    0.0003    0.0128   -0.0122    0.0003   -0.0011    0.0017    0.0003    0.00
   -0.0011    0.0140   -0.0120    0.0003    0.0005    0.0001    0.0003    0.0003    0.00
    0.0126   -0.0120    0.0003    0.0003   -0.0011    0.0017    0.0005    0.0001    0.00
   -0.0108    0.0003    0.0003    0.0003    0.0003    0.0003    0.0003    0.0003    0.01
    0.0003    0.0005    0.0001   -0.0011    0.0017    0.0003    0.0003    0.0126   -0.01
    0.0003    0.0003    0.0003    0.0005    0.0001    0.0003    0.0126   -0.0134    0.00
    0.0003    0.0003   -0.0011    0.0017    0.0003    0.0128   -0.0122    0.0003    0.00
    0.0003    0.0003    0.0003    0.0003    0.0127   -0.0120   -0.0011    0.0018    0.00
```

CHECK

```
inv(matA)
```

```
ans = 9×9
    0.0005   -0.0012    0.0017    0.0126   -0.0121    0.0003    0.0003    0.0003    0.00
    0.0003    0.0003    0.0128   -0.0122    0.0003   -0.0011    0.0017    0.0003    0.00
   -0.0011    0.0140   -0.0120    0.0003    0.0005    0.0001    0.0003    0.0003    0.00
    0.0126   -0.0120    0.0003    0.0003   -0.0011    0.0017    0.0005    0.0001    0.00
   -0.0108    0.0003    0.0003    0.0003    0.0003    0.0003    0.0003    0.0003    0.01
    0.0003    0.0005    0.0001   -0.0011    0.0017    0.0003    0.0003    0.0126   -0.01
    0.0003    0.0003    0.0003    0.0005    0.0001    0.0003    0.0126   -0.0134    0.00
    0.0003    0.0003   -0.0011    0.0017    0.0003    0.0128   -0.0122    0.0003    0.00
    0.0003    0.0003    0.0003    0.0003    0.0127   -0.0120   -0.0011    0.0018    0.00
```

```
round(invA-inv(matA),14)==0 % GJE: 1.0e-14의 자리까지 일치
```

```
ans = 9×9 logical 배열
```

```
   1   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1
```

FUNCTIONS

```
function M=minor(A,col) % Minor of a=A(1,col)
M=0;
A(1,:)=[];
A(:,col)=[];
if size(A)~=2
    for n=1:size(A,2)
        a=A(1,n);
        M=M+(-1)^(1+n)*a*minor(A,n);
    end
else
    M=A(1)*A(4)-A(2)*A(3); % 2x2 determinant
end
end

function C=cof(A,col) % Cofactor of a=A(1,col)
C=(-1)^(1+col)*minor(A,col);
end

function E=GE(A) % Gaussian Elimination
for n=1:size(A,2)
    for m=n+1:size(A,1)
        A(m,:)=A(m,:)-A(n,:)*A(m,n)/A(n,n);
        E=A;
    end
end
end

function RE=GJE(A) % Gauss-Jordan Elimination
for n=1:size(A,1)
    for m=[n+1:size(A,1) 1:n-1]
        A(m,:)=A(m,:)-A(n,:)*A(m,n)/A(n,n);
    end
    A(n,:)=A(n,:)/A(n,n); % Scaling
    RE=A;
end
end
```