수치해석 00반
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example 8.1

```
>> A = [1 5 6; 7 4 2; -3 6 7]
A =

   1   5   6
   7   4   2
  -3   6   7

>> A'
ans =

   1   7  -3
   5   4   6
   6   2   7

>> x = [8 6 9];
>> y = [-5 8 1];
>> z = [
4 8 2];
>> B = [x; y; z;]
B =

   8   6   9
  -5   8   1
   4   8   2

>> C = A + B
C =

    9   11   15
    2   12    3
    1   14    9

>> A = C - B
A =

   1   5   6
   7   4   2
  -3   6   7
```

```
>> A*B
ans =

    7   94   26
   44   90   71
  -26   86   -7

>> A.*B
ans =

    8   30   54
  -35   32    2
  -12   48   14

>> D = [1 4 3; 4 7 ];
error: vertical dimensions mismatch (1x3 vs 1x2)
>> D = [1 4 3; 5 8 1 ];
>> D*A
ans =

   20   39   35
   58   63   53

>> AI = inv(A)
AI =

   0.246154   0.015385  -0.215385
  -0.846154   0.384615   0.615385
   0.830769  -0.323077  -0.476923

>> A*AI
ans =

   1.0000e+00  -2.2204e-16  -1.1102e-16
   4.4409e-16   1.0000e+00  -3.3307e-16
   8.8818e-16  -7.7716e-16   1.0000e+00
```

```
>> I = eye(3)
I =

Diagonal Matrix

   1   0   0
   0   1   0
   0   0   1

>> P = [0 1 1; 0 1 0; 1 0 0]
P =

   0   1   1
   0   1   0
   1   0   0

>> PA = P*A
PA =

    4   10    9
    7    4    2
    1    5    6

>> AP = A*P
AP =

    6    6    1
    2   11    7
    7    3   -3

>> Aug = [A I]
Aug =

   1   5   6   1   0   0
   7   4   2   0   1   0
  -3   6   7   0   0   1

>> [n,m] = size(Aug)
n =  3
m =  6
```

example 8.2

```
>> K = [150 -100 0; -100 150 -50; 0 -50 50]
K =

   150  -100     0
  -100   150   -50
     0   -50    50

>> mg = [588.6; 686.7; 784.8]
mg =

   588.60
   686.70
   784.80

>> x = K/mg
error: operator /: nonconformant arguments (op1 is 3x3, op2 is 3x1)
>> x = K\mg
x =

   41.202
   55.917
   71.613

>> x = inv(K)*mg
x =

   41.202
   55.917
   71.613

>> xi = [20;
40;60;];
>> xf = x+xi
xf =

    61.202
    95.917
   131.613
```

example 8.3

```
>> A = [1 1 1 0 0 0
0 -1 0 1 -1 0
0 0 -1 0 0 1
0 0 0 0 1 -1
0 10 -10 0 -15 -5
5 -10 0 -20 0 0]';
>> b = [0 0 0 0 0 200]';
>> current = A\b
current =

     7.6923
   -30.7692
    61.5385
  -111.5385
    -5.3846
    -1.5385
```

연습문제 8.7

```
function AT=matran(A)

[m,n]=size(A);
for i = 1:m
for j = 1:n
AT(j,i) = A(i,j);
end
end
```

```
>> A=[6 -1;12 7;-5 3];
>> B=[4 0;0.6 8];
>> C=[1 -2;-6 1];
>> matran(A)
ans =

    6   12   -5
   -1    7    3

>> matran(B)
ans =

   4.00000   0.60000
   0.00000   8.00000

>> matran(C)
ans =

   1  -6
  -2   1
```

연습문제 8.8

```
function B = permut(A,r1,r2)
[m,n] = size(A);
if m ~= n, error('matrix not square'), end
if r1 == r2 | r1>m | r2>m
error('row numbers are equal or exceed matrix dimensions')
end
P = zeros(n);
P(r1,r2)=1;P(r2,r1)=1;
for i = 1:m
if i~=r1 & i~=r2
P(i,i)=1;
end
end
B=P*A;
```

```
>> A = [1 2 3 4;5 6 7 8;9 10 11 12; 13 14 15 16]
A =

    1    2    3    4
    5    6    7    8
    9   10   11   12
   13   14   15   16

>> B = permut(A,3,1)
warning: Matlab-style short-circuit operation pe:
warning: called from
    permut at line 10 column 1
B =

    9   10   11   12
    5    6    7    8
    1    2    3    4
   13   14   15   16
```

example 9.3

예제 9.3

$3x_1 - 0.1x_2 - 0.2x_3 = 7.85$ ①

$0.1x_1 + 7x_2 - 0.3x_3 = -19.3$ ②

$0.3x_1 - 0.2x_2 + 10x_3 = 71.4$ ③

② - ① × $\frac{0.1}{3}$ ⇒ $7.00333x_2 - 0.293333x_3 = -19.5617$

③ - ① × $\frac{0.3}{3}$ ⇒ $3x_1 - 0.1x_2 - 0.2x_3 = 7.85$ ①

$7.00333x_2 - 0.293333x_3 = -19.5617$ ②

$-0.190000x_2 + 10.0206x_3 = 70.6150$ ③

전진소거 ⇒ ③ - ② × $\frac{-0.190000}{7.00333}$

⇒ $3x_1 - 0.1x_2 - 0.2x_3 = 7.85$

$7.00333x_2 - 0.293333x_3 = -19.5617$

$10.0120x_3 = 70.6843$

$x_3 = \frac{70.0843}{10.0120} = 7.00003$

$x_2 = \frac{-19.5617 + 0.293333(7.00003)}{7.00333} = -2.50000$

$x_1 = \frac{7.85 + 0.1(-2.50000) + 0.2(7.00003)}{3} = 3.00000$

example 9.4

```
function x = GaussNaive(A,b)
[m,n] = size(A);
if m ~=n, error('Matrix A must be square'); end
nb = n+1;
Aug = [A b];
for k = 1:n+1
  for i = k+1:n
    factor = Aug(i,k)/Aug(k,k);
    Aug(i,k:nb) = Aug(i,k:nb)-factor*Aug(k,k:nb);
  end
end
x = zeros(n,1);
x(n) = Aug(n,nb)/Aug(n,n);
for i = n-1:-1:1
  x(i) = (Aug(i,nb)-Aug(i,i+1:n)*x(i+1:n))/Aug(i,i);
end
```

```
>> A = [0.00003 3.0000
1.0000 1.0000]
A =

   0.000030000   3.000000000
   1.000000000   1.000000000

>> b = [2.0001
1.0000]
b =

   2.0001
   1.0000

>> GaussNaive (A,b)
error: 'aug' undefined near line 8 column 23
error: called from
    GaussNaive at line 8 column 12
>> GaussNaive (A,b)
ans =

   0.33330
   0.66670
```

연습문제 9.6

연습문제 9-6

(a) $10x_1 + 2x_2 - x_3 = 27$ ①

$-4.4x_2 + 1.7x_3 = -53.4$ ②

$0.8x_2 + 6.1x_3 = -24.2$ ③

②, ③번 정리하면

$6.409091 x_3 = -33.9091$

$x_3 = \dfrac{-33.9091}{6.409091} = -5.29078$

$x_2 = \dfrac{(-53.4 - 1.7(-5.29078))}{-4.4} = 10.0922$

$x_1 = \dfrac{(27 - 5.29078 - 2(10.0922))}{10} = 0.152482$

(b) $10(0.152482) + 2(10.0922) - (-5.29078) = 27$

$-3(0.152482) - 5(10.0922) + 2(-5.29078) = -61.5$

$0.152482 + 10.0922 + 5(-5.29078) = -21.5$

연습문제 9.7

연습문제 9-7

(a) $-8x_1 + x_2 - 2x_3 = -20$ ①

$-3x_1 - x_2 + 7x_3 = -34$ ②

$2x_1 - 6x_2 - x_3 = -38$ ③

①$\times(-3)/(-8)$ + ③ $\Rightarrow$ $-5.75x_2 - 1.5x_3 = -43$ ④

$-1.375x_2 + 7.25x_3 = -26.5$ ⑤

①$\times(-1.375)/(-1.375)$ + ⑤ $\Rightarrow$ $8.108696x_3 = -16.21739$

$\therefore x_3 = \dfrac{-16.21739}{8.108696} = -2$

$x_2 = \dfrac{-43 + 1.5(-2)}{-5.75} = 8$

$x_3 = \dfrac{-20 + 2(-2) - 8}{-8} = 4$

(b) $2(4) - 6(8) - (-2) = -38$

$-3(4) - (8) + 7(-2) = -34$

$-8(4) + (8) - 2(-2) = -20$

연습문제 9.17

```
function [x, D] = GaussPivotNew(A, b, tol)
[m,n]=size(A);
if m~=n, error('Matrix A must be square'); end
nb=n+1;
Aug=[A b];
npiv=0;
for k = 1:n-1
[big,i]=max(abs(Aug(k:n,k)));
ipr=i+k-1;
if ipr~=k
npiv=npiv+1;
Aug([k,ipr],:)=Aug([ipr,k],:);
end
absakk=abs(Aug(k,k));
if abs(Aug(k,k))<=tol
D=0;
error('Singular or near singular system')
end
for i = k+1:n
factor=Aug(i,k)/Aug(k,k);
Aug(i,k:nb)=Aug(i,k:nb)-factor*Aug(k,k:nb);
end
end
for i = 1:n
if abs(Aug(i,i))<=tol
D=0;
error('Singular or near singular system')
end
end
x=zeros(n,1);
x(n)=Aug(n,nb)/Aug(n,n);
for i = n-1:-1:1
x(i)=(Aug(i,nb)-Aug(i,i+1:n)*x(i+1:n))/Aug(i,i);
end
```

```
D=(-1)^npiv;
for i=1:n
D=D*Aug(i,i);
end
```

```
>> A=[0.5 -1;1.02 -2];
>> b=[-9.5;-18.8];
>> [x, D] = GaussPivotNew(A,b,1e-5)
x =

   10
   14.5

D = 0.02
>> D=det(A)
D = 0.02
```