Exercise#1

```
clear
```

```
format short
type ele1
```

```
function E1=ele1(n,r,i,j)
E1=eye(n);
E1(j,:) = E1(j,:) + E1(i,:).*r;
end
```

```
type ele2
```

```
function E2=ele2(n,i,j)
E2=eye(n);
E2([i j],:) = E2([j i],:);
end
```

```
type ele3
```

```
function E3=ele3(n,j,k)
E3=eye(n);
E3(j,:)=E3(j,:).*k;
end
```

Part 1

```
n=4; r=5; i=1; j=3; k=2
```

```
k = 2
```

(a)

```
I=eye(4)
```

```
I = 4×4
     1     0     0     0
     0     1     0     0
     0     0     1     0
     0     0     0     1
```

```
E1=ele1(n,r,i,j)
```

```
E1 = 4×4
     1     0     0     0
     0     1     0     0
     5     0     1     0
     0     0     0     1
```

```
% row 3 is replaced with (row 3) plus 5*(row 1)
```

```
E2=ele2(n,i,j)
```

```
E2 = 4×4
     0     0     1     0
     0     1     0     0
     1     0     0     0
     0     0     0     1
```

```
% rows 1 and 3 are interchanged
```

```
E3=ele3(n,j,k)
```

```
E3 = 4×4
     1     0     0     0
     0     1     0     0
     0     0     2     0
     0     0     0     1
```

```
% row 3 is scaled by k=2
```

(b)

```
detI=det(I)
```

```
detI = 1
```

```
detE1=det(E1)
```

```
detE1 = 1
```

```
% same as detI
```

```
detE2=det(E2)
```

```
detE2 = -1
```

```
% negative of detI
```

```
detE3=det(E3)
```

```
detE3 = 2
```

```
% 2 times detI (based on k, which is 2 here)
```

(c)

```
invE1=inv(E1)
```

```
invE1 = 4×4
     1     0     0     0
     0     1     0     0
    -5     0     1     0
     0     0     0     1
```

```
% the 5 is now a -5
```

```
invE2=inv(E2)
```

```
invE2 = 4×4
     0     0     1     0
     0     1     0     0
     1     0     0     0
     0     0     0     1
```

```
% same as E2
```

```
invE3=inv(E3)
```

```
invE3 = 4×4
    1.0000         0         0         0
         0    1.0000         0         0
         0         0    0.5000         0
         0         0         0    1.0000
```

```
% the 2 is now a 0.5
```

(d)

```
M=[1 1 1 1; 2 2 2 2; 3 3 3 3; 4 4 4 4]
```

```
M = 4×4
     1     1     1     1
     2     2     2     2
     3     3     3     3
     4     4     4     4
```

```
E1*M
```

```
ans = 4×4
     1     1     1     1
     2     2     2     2
     8     8     8     8
     4     4     4     4
```

```
% row 3 replaced by (row 3) plus 5*(row 1)
```

```
E2*M
```

```
ans = 4×4
     3     3     3     3
     2     2     2     2
     1     1     1     1
     4     4     4     4
```

```
% row 1 and 2 interchanged
```

```
E3*M
```

```
ans = 4×4
     1     1     1     1
     2     2     2     2
     6     6     6     6
     4     4     4     4
```

```
% row 3 scaled by 2
```

Part 2

```
A=eye(6)
```

```
A = 6×6
     1     0     0     0     0     0
     0     1     0     0     0     0
     0     0     1     0     0     0
     0     0     0     1     0     0
     0     0     0     0     1     0
     0     0     0     0     0     1
```

```
E1=ele1(6,3,2,5)
```

```
E1 = 6×6
     1     0     0     0     0     0
     0     1     0     0     0     0
     0     0     1     0     0     0
     0     0     0     1     0     0
     0     3     0     0     1     0
     0     0     0     0     0     1
```

```
E2=ele2(6,2,3)
```

```
E2 = 6×6
     1     0     0     0     0     0
     0     0     1     0     0     0
     0     1     0     0     0     0
     0     0     0     1     0     0
     0     0     0     0     1     0
     0     0     0     0     0     1
```

```
E3=ele3(6,4,5)
```

```
E3 = 6×6
     1     0     0     0     0     0
     0     1     0     0     0     0
     0     0     1     0     0     0
     0     0     0     5     0     0
     0     0     0     0     1     0
```

```
     0     0     0     0     0     1
```

```
A=E3*E2*E1*A
```

```
A = 6×6
     1     0     0     0     0     0
     0     0     1     0     0     0
     0     1     0     0     0     0
     0     0     0     5     0     0
     0     3     0     0     1     0
     0     0     0     0     0     1
```

```
% We know this matrix is invertible because it began as the identity square
% matrix. Only elementary row operations were performed on it, which are
% reversible. This means a reduced form of this matrix is the identity
% matrix that we started with. All identity matrices are linearly
% independent and invertible. Therefore, this matrix is invertible.
```

```
inv1=inv(A)
```

```
inv1 = 6×6
    1.0000         0         0         0         0         0
         0         0    1.0000         0         0         0
         0    1.0000         0         0         0         0
         0         0         0    0.2000         0         0
         0         0   -3.0000         0    1.0000         0
         0         0         0         0         0    1.0000
```

```
inv2=inv(E1)*inv(E2)*inv(E3)
```

```
inv2 = 6×6
    1.0000         0         0         0         0         0
         0         0    1.0000         0         0         0
         0    1.0000         0         0         0         0
         0         0         0    0.2000         0         0
         0         0   -3.0000         0    1.0000         0
         0         0         0         0         0    1.0000
```

```
if(isequal(inv1,inv2))
    disp("The inverses match.")
else
    disp("Check the code!")
end
```

```
The inverses match.
```