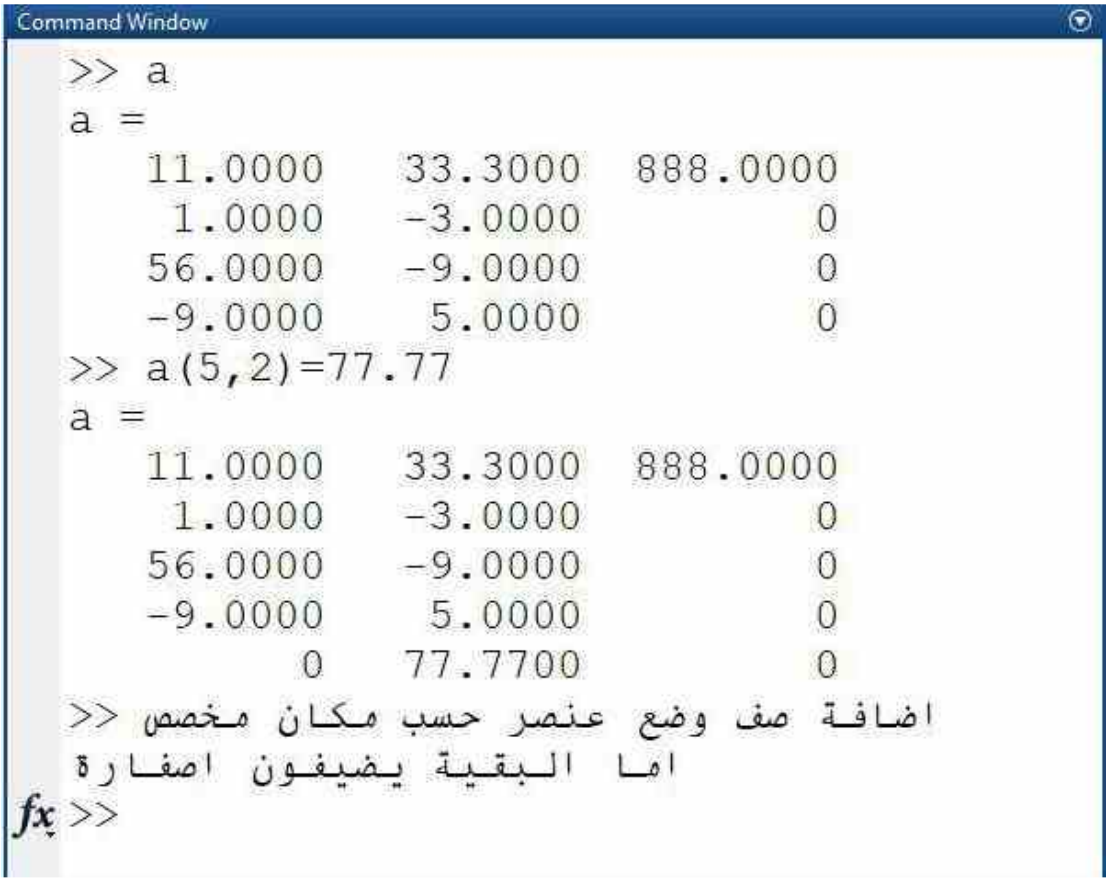
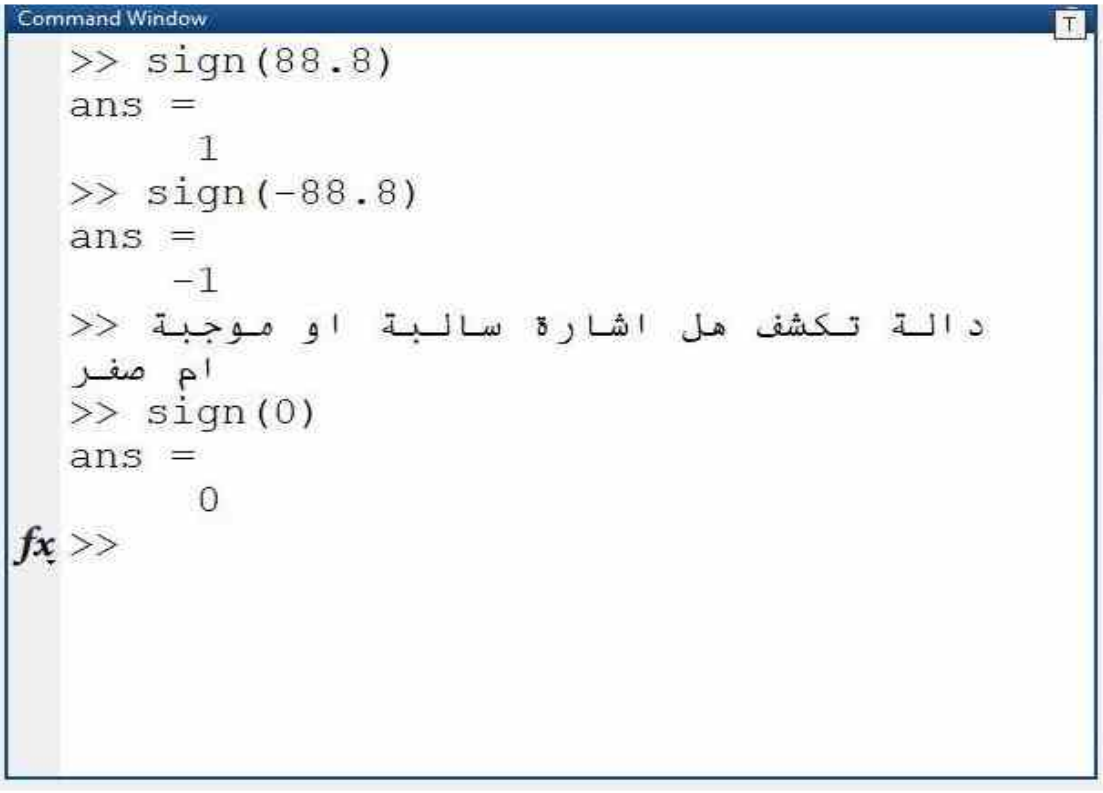
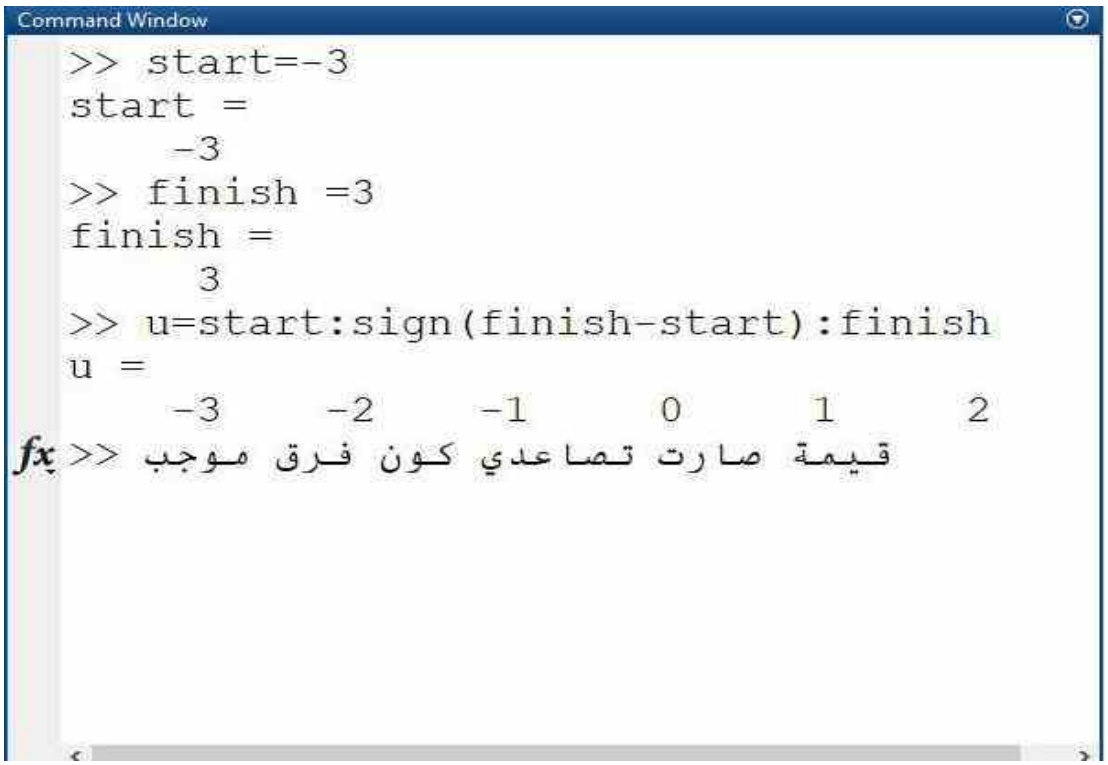
- مراجعة للمصفوفات

```
Command Window
>> a
a =
     1     2    -3
    -4     5     6
    -7     8    -9
    -9     8     5
>> a=[11 -22 33.3;a]
a =
   11.0000  -22.0000   33.3000
    1.0000    2.0000   -3.0000
   -4.0000    5.0000    6.0000
   -7.0000    8.0000   -9.0000
   -9.0000    8.0000    5.0000
fx >> اضافة في بداية المصفوفة وتحويلها
   ارقام الى اعداد الحقيقية
```

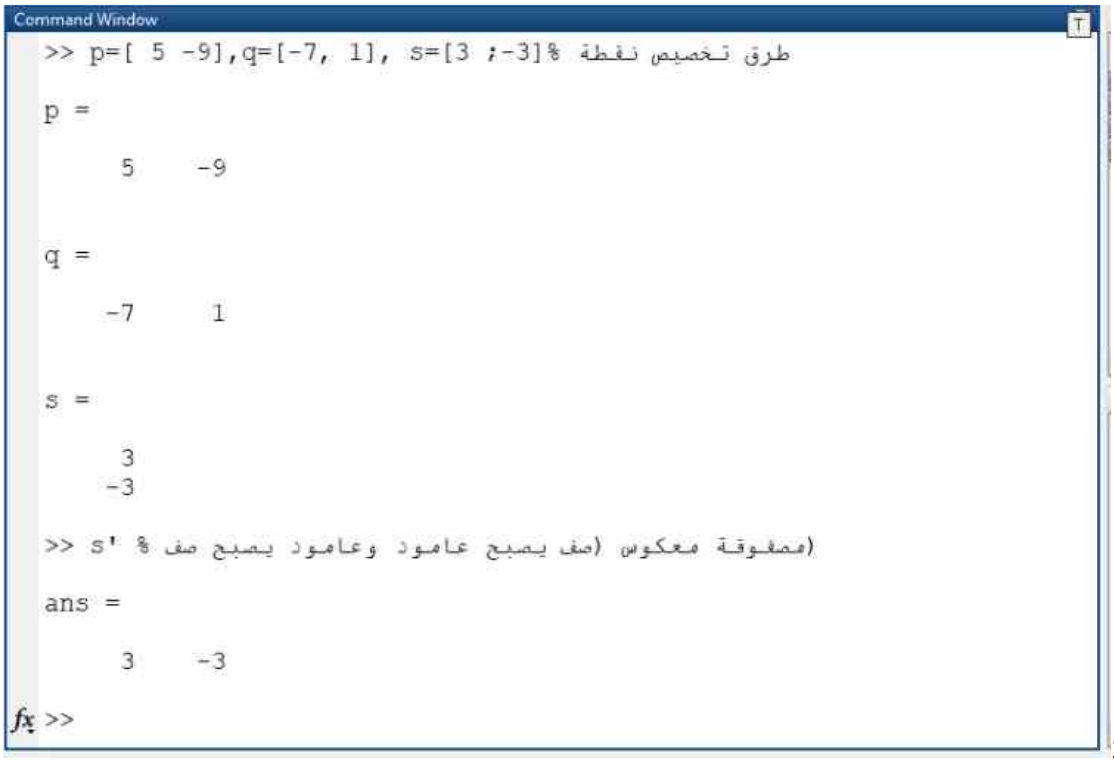
```
Command Window
>> a
a =
     1     2    -3
    -4     5     6
    -7     8    -9
>> a=[a; -9 8 5]
a =
     1     2    -3
    -4     5     6
    -7     8    -9
    -9     8     5
fx >> اضافه في صف الاخير
```

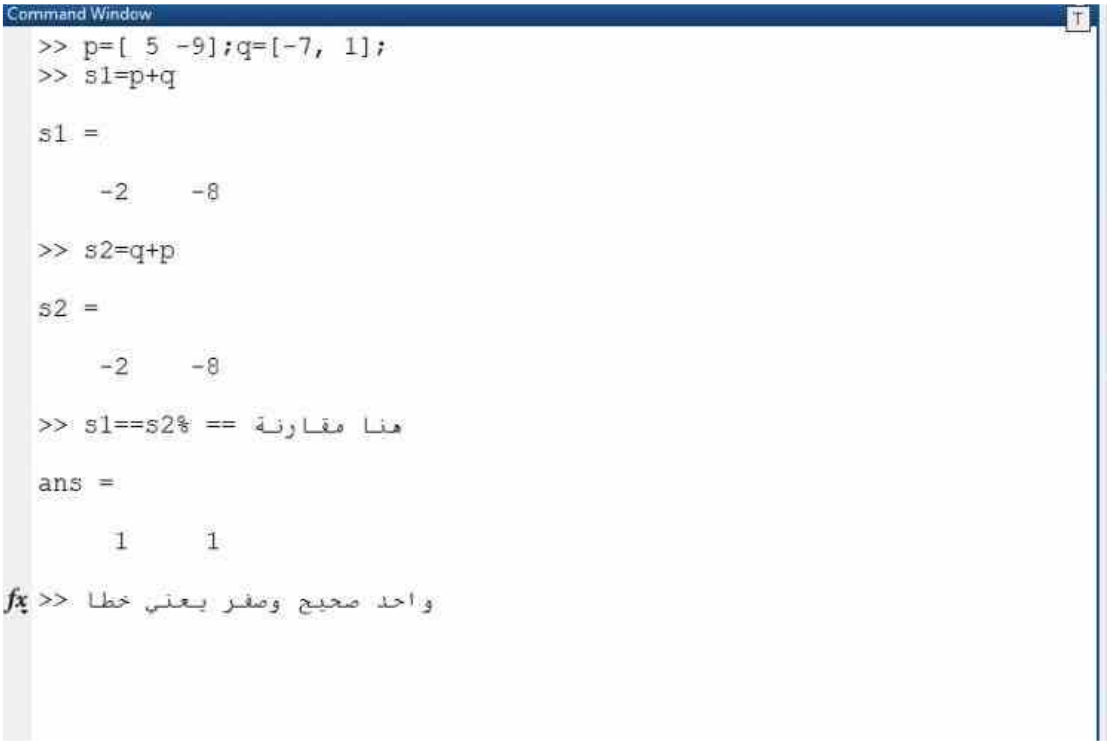

Command Window
>> a
a =
11.0000 33.3000 888.0000
1.0000 -3.0000 0
56.0000 -9.0000 0
-9.0000 5.0000 0
>> a(5,2)=77.77
a =
11.0000 33.3000 888.0000
1.0000 -3.0000 0
56.0000 -9.0000 0
-9.0000 5.0000 0
0 77.7700 0
>> اضافة صف وضع عنصر حسب مكان مخصص
اما البقية يضيفون اصفارة
>>

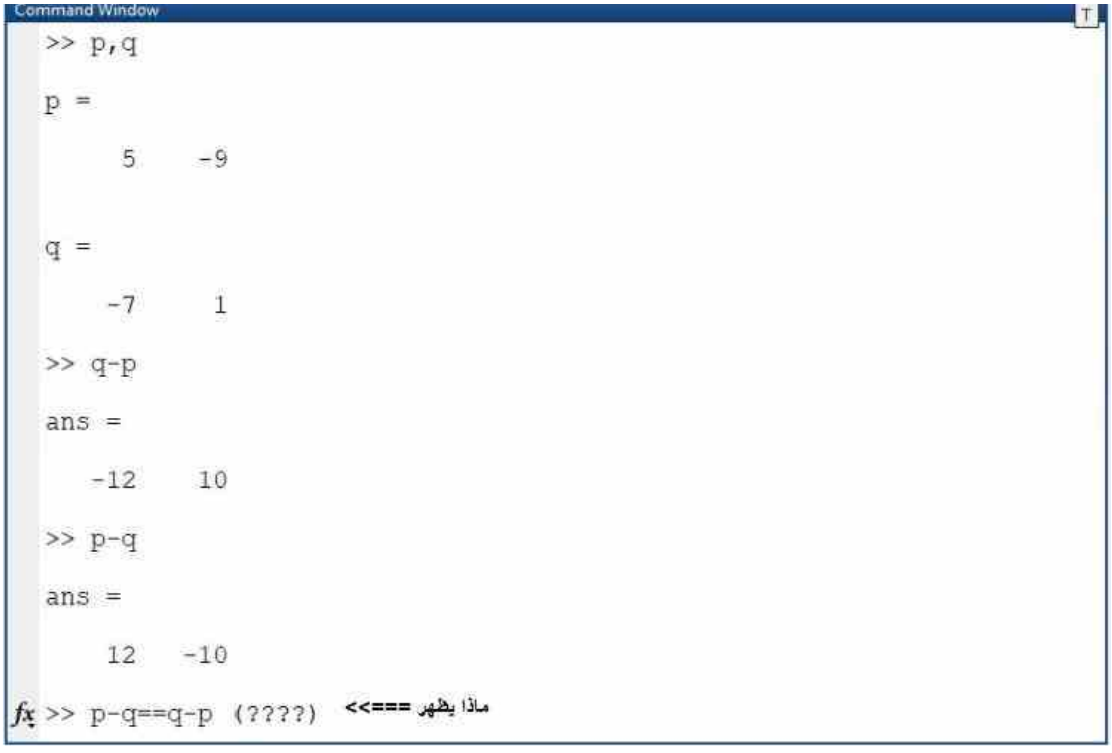

Command Window
>> sign(88.8)
ans =
1
>> sign(-88.8)
ans =
-1
>> دالة تكشف هل اشارة سالبة او موجبة
ام صفر
>> sign(0)
ans =
0
>>


Command Window
>> start=-3
start =
-3
>> finish =3
finish =
3
>> u=start:sign(finish-start):finish
u =
-3 -2 -1 0 1 2
>> قيمة صارت تصاعدي كون فرق موجب

المتجهات

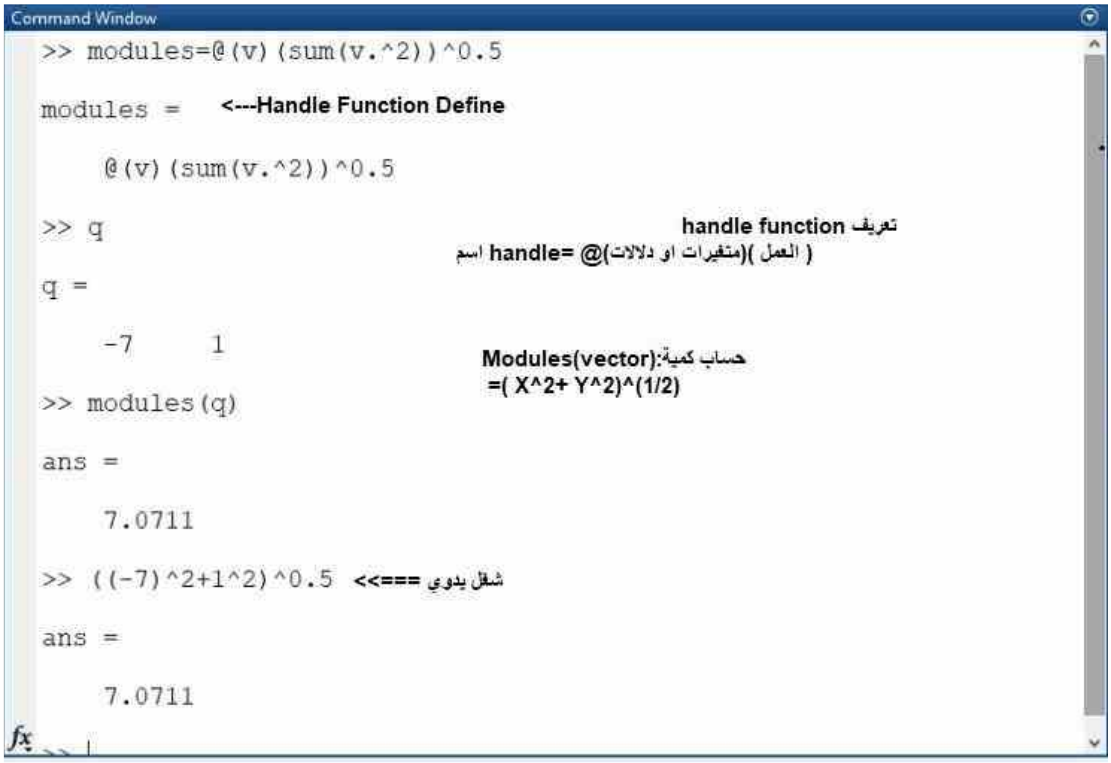

Command Window
>> p=[5 -9],q=[-7, 1], s=[3 ;-3]% طرق تخصيص نقطة
p =
5 -9
q =
-7 1
s =
3
-3
>> s' % مصفوفة معكوس (صف يصبح عامود وعامود يصبح صف)
ans =
3 -3
>>

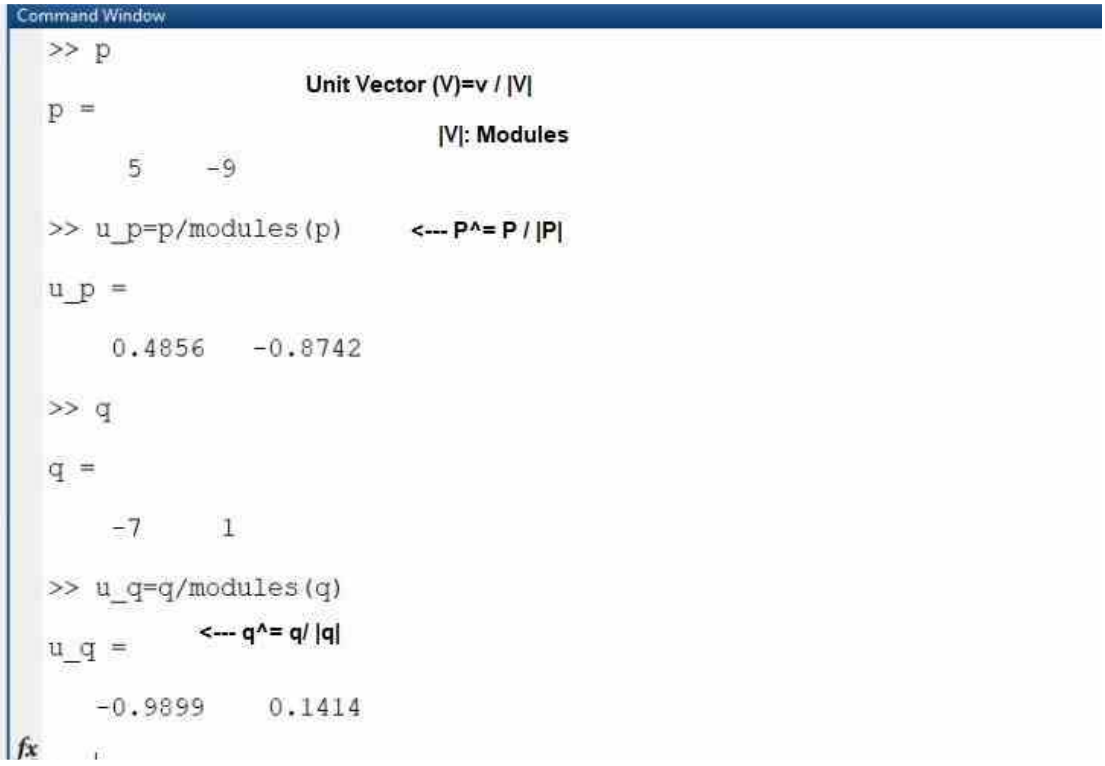

Command Window
>> p=[5 -9];q=[-7, 1];
>> s1=p+q
s1 =
-2 -8
>> s2=q+p
s2 =
-2 -8
>> s1==s2% == هنا مقارنة
ans =
1 1
>> واحد صحيح وصفر يعني خطا


Command Window
>> p,q
p =
5 -9
q =
-7 1
>> q-p
ans =
-12 10
>> p-q
ans =
12 -10
>> p-q==q-p (????) <<=== ماذا يظهر

```
Command Window
>> p

p =

     5    -9

>> sum(p)

ans =

    -4

>> p.^2

ans =

    25    81

fx >>
```

```
Command Window
>> 3^2

ans =

     9

>> 3.^2

ans =

     9

>> [3 -1]^2
Error using  ^
Inputs must be a scalar and a square matrix.
To compute elementwise POWER, use POWER (.^) instead.

>> [3 -1].^2

ans =

     9     1

fx >> ملاحظة .^ تستخدم اذا هنا اكثر من عنصر اما ^ تستخدم عنصر واحد
```


Command Window
>> modules=@(v)(sum(v.^2))^0.5
modules =
<---Handle Function Define
@(v)(sum(v.^2))^0.5
>> q
q =
-7 1
>> modules(q)
ans =
7.0711
>> ((-7)^2+1^2)^0.5
<<=== شغل يدوي
ans =
7.0711
handle function تعريف
اسم handle= @(متغيرات او دلالات)(العمل)
Modules(vector):حساب كمية
=(X^2+ Y^2)^(1/2)


Command Window
>> p
p =
5 -9
>> u_p=p/modules(p)
u_p =
0.4856 -0.8742
>> q
q =
-7 1
>> u_q=q/modules(q)
u_q =
-0.9899 0.1414
Unit Vector (V)=v / |V|
|V|: Modules
<--- P^= P / |P|
<--- q^= q/ |q|

```
Command Window
>> p,q

p =

     5    -9


q =

    -7     1

>> dot(p,q)          p.q (dot product)

ans =

   -44

>> (5*-7)+(-9*1)   <--- شغل يدوي

ans =

   -44

fx >>
```

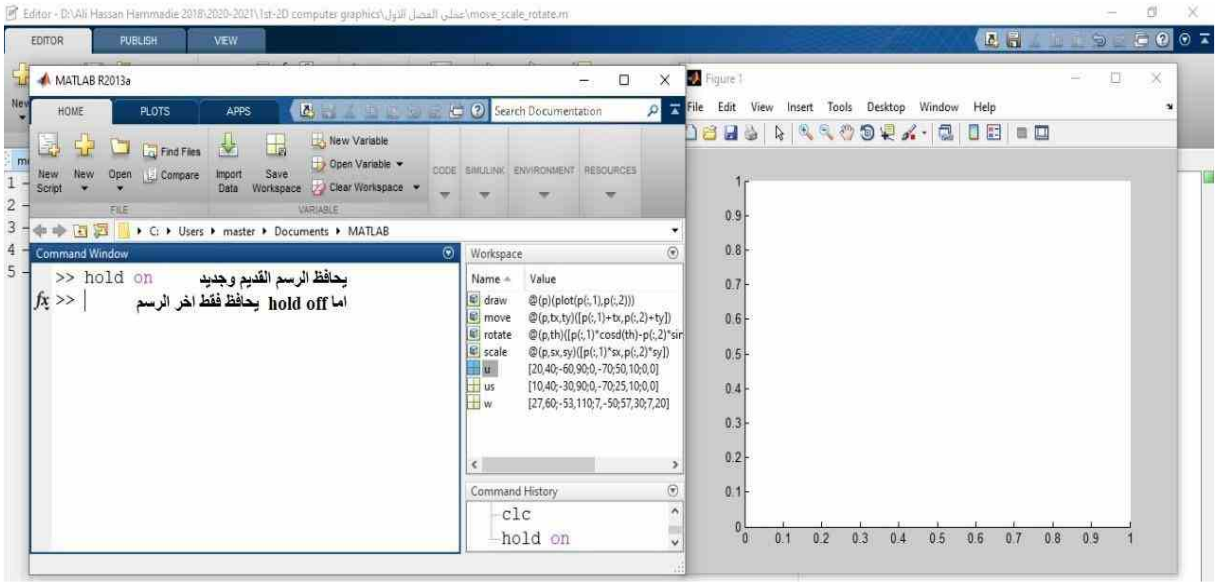
```
Command Window
>> q

q =

    -7     1   <---- q(1) is X-axis while q(2) is y-axis

>> modules(q)

ans =

    7.0711   Using Direction Cosine to find angles

>> cX=acosd(q(1)/modules(q))   <----- cX=inverse_Cos(q_x / |q|)

cX =

  171.8699

>> cY=acosd(q(2)/modules(q)) <------ cY=inverse_Cos(q_y / |q|)

cY =

   81.8699

fx
```

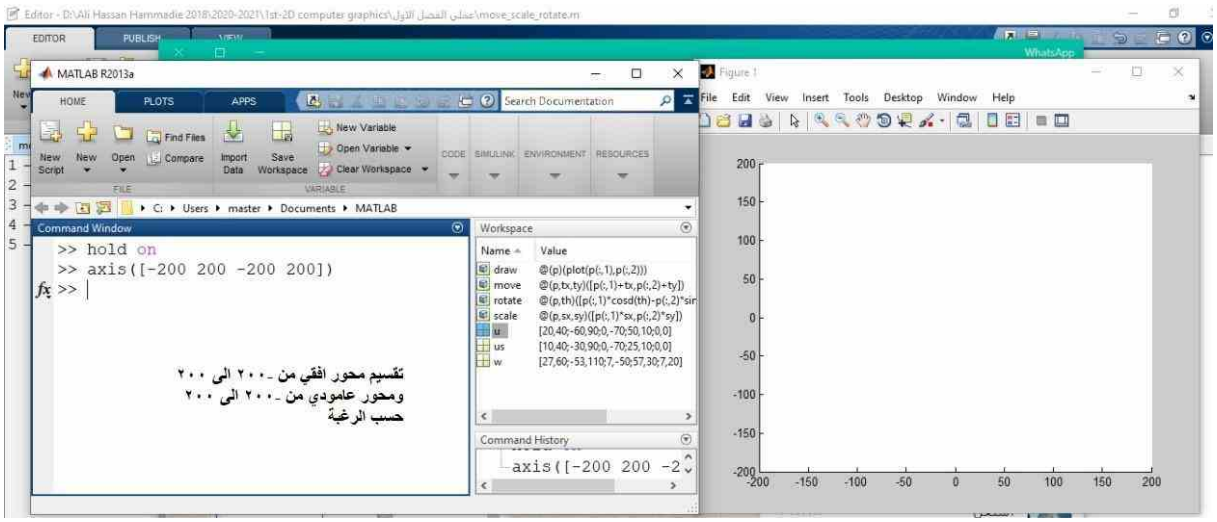
الملاحظة:

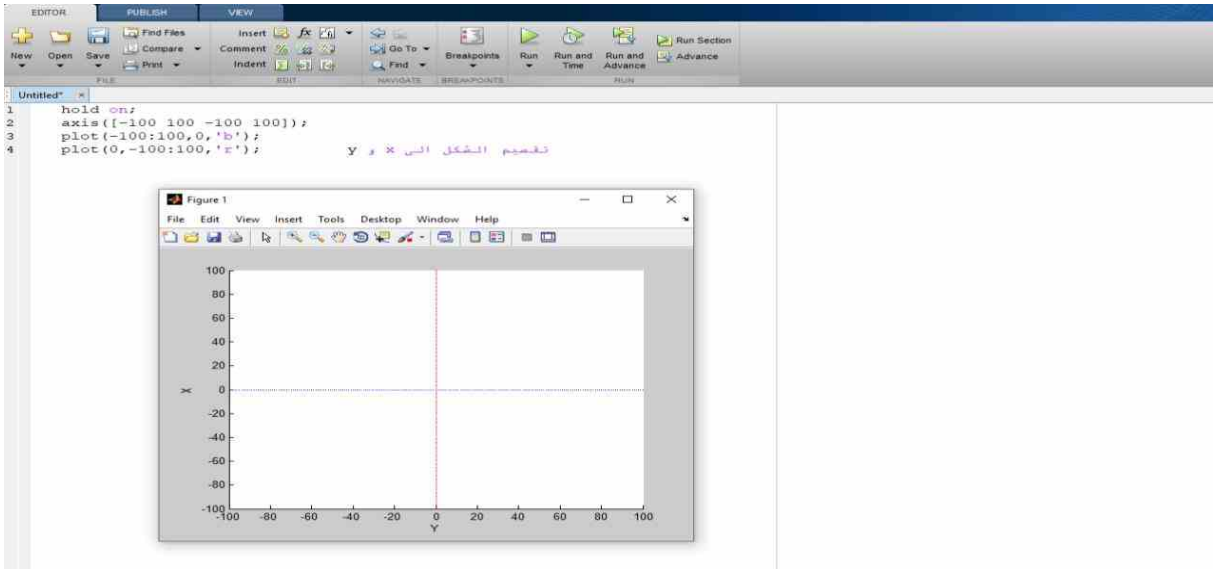
cos(z) z زاوية بالتقدير دائري
cosd(z) z الزاوية بالتقدير بالدرجة

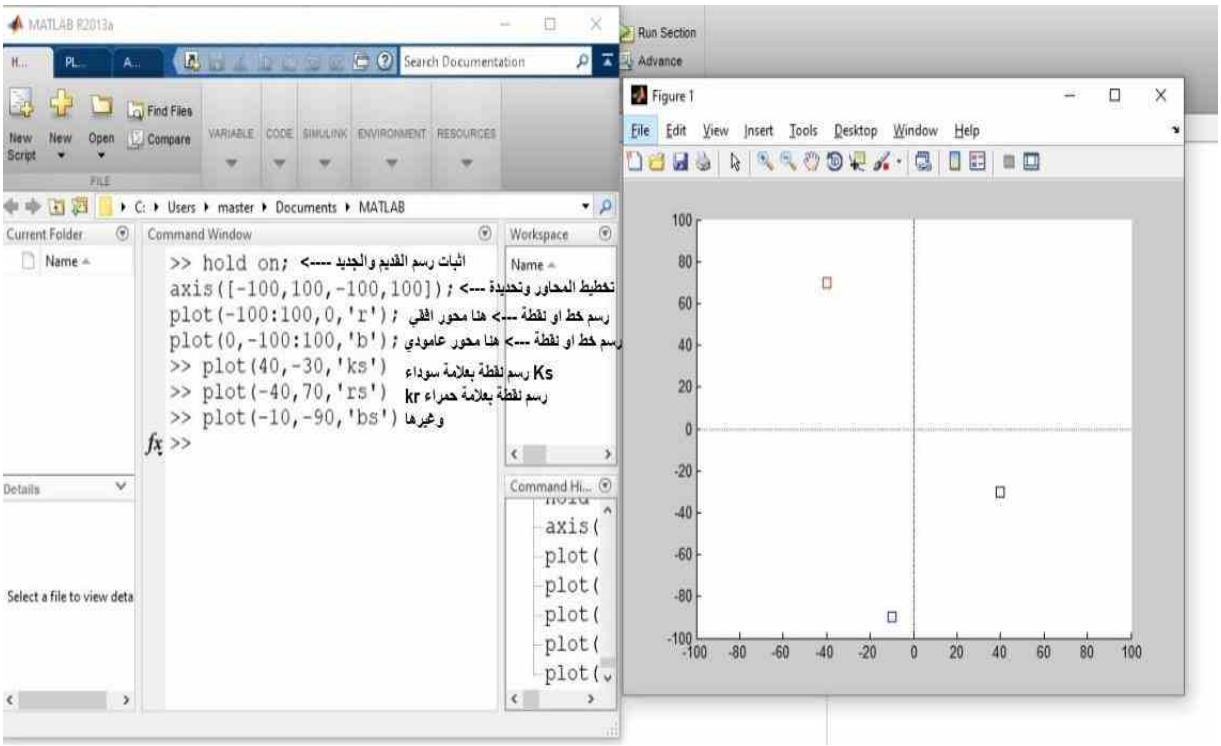
acos(z) z معكوس جيب تمام لزاوية بالتقدير الدائري
acosd(z) z معكوس جيب تمام لزاوية بالتقدير الدرجات

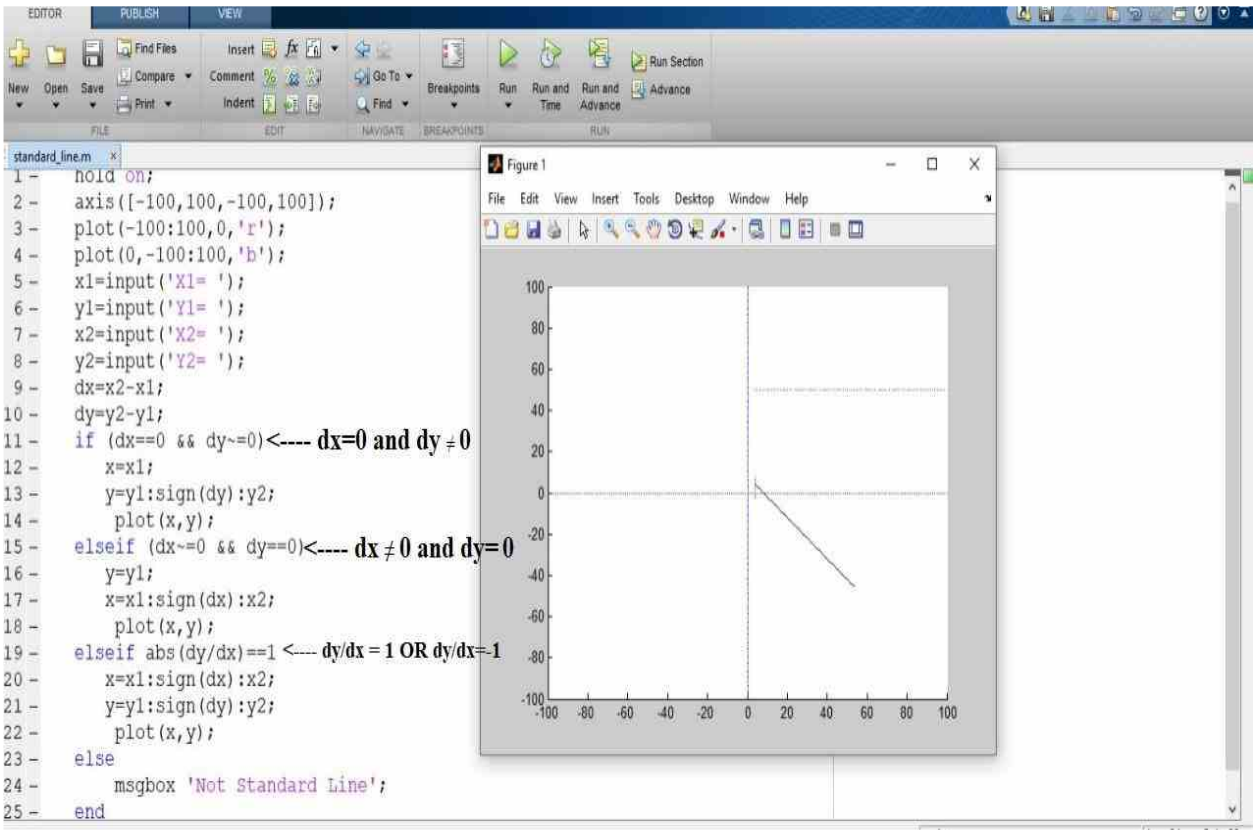
نفس شي لبقية الدوال المثلثية


MATLAB R2013a
>> hold on
يحافظ الرسم القديم وجديد
>> hold off
اما يحافظ فقط اخر الرسم

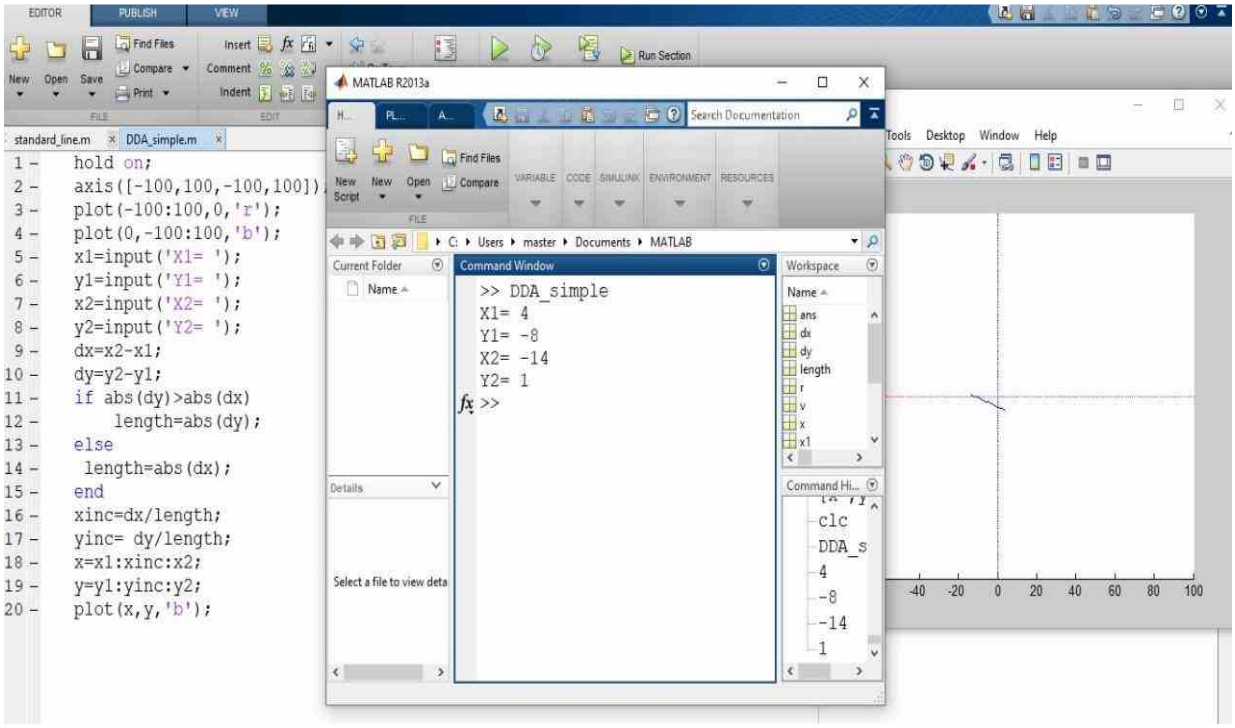

MATLAB R2013a
>> hold on
>> axis([-200 200 -200 200])
تقسيم محور افقي من -٢٠٠ الى ٢٠٠
ومحور عامودي من -٢٠٠ الى ٢٠٠
حسب الرغبة


hold on;
axis([-100 100 -100 100]);
plot(-100:100,0,'b');
plot(0,-100:100,'r');
تقسيم الشكل الى x و y
Figure 1
File Edit View Insert Tools Desktop Window Help


MATLAB R2013a
Search Documentation
Find Files
Compare
New Script
New
Open
C: Users master Documents MATLAB
Current Folder
Command Window
Workspace
>> hold on; <---- اثبات رسم القديم والجديد
axis([-100,100,-100,100]); <--- تخطيط المحاور وتحديدة
plot(-100:100,0,'r'); <--- رسم خط او نقطة هنا محور افقي
plot(0,-100:100,'b'); <--- رسم خط او نقطة هنا محور عامودي
>> plot(40,-30,'ks') رسم نقطة بعلامة سوداء Ks
>> plot(-40,70,'rs') رسم نقطة بعلامة حمراء kr
>> plot(-10,-90,'bs') وغيرها
Run Section
Advance
Figure 1
File Edit View Insert Tools Desktop Window Help



```
hold on;
axis([-100,100,-100,100]);
plot(-100:100,0,'r');
plot(0,-100:100,'b');
x1=input('X1= ');
y1=input('Y1= ');
x2=input('X2= ');
y2=input('Y2= ');
dx=x2-x1;
dy=y2-y1;
if (dx==0 && dy~=0)<---- dx=0 and dy ≠ 0
   x=x1;
   y=y1:sign(dy):y2;
    plot(x,y);
elseif (dx~=0 && dy==0)<---- dx ≠ 0 and dy= 0
   y=y1;
   x=x1:sign(dx):x2;
    plot(x,y);
elseif abs(dy/dx)==1 <---- dy/dx = 1 OR dy/dx=-1
   x=x1:sign(dx):x2;
   y=y1:sign(dy):y2;
    plot(x,y);
else
    msgbox 'Not Standard Line';
end
```

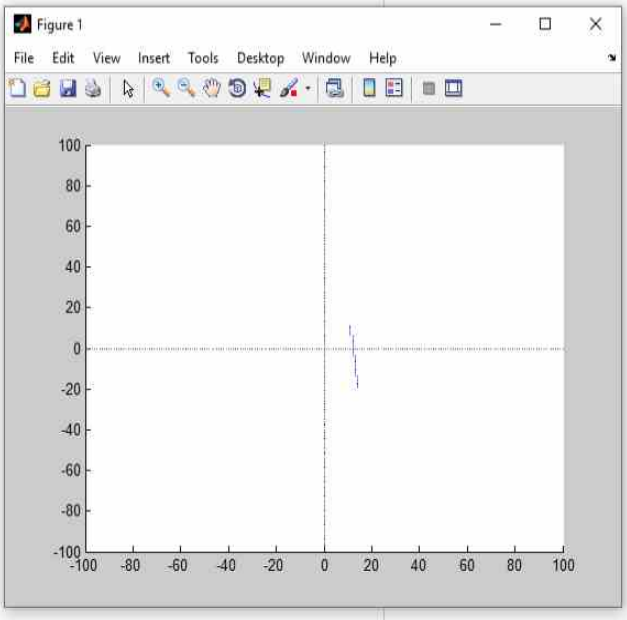


```
hold on;
axis([-100,100,-100,100]);
plot(-100:100,0,'r');
plot(0,-100:100,'b');
x1=input('X1= ');
y1=input('Y1= ');
x2=input('X2= ');
y2=input('Y2= ');
dx=x2-x1;
dy=y2-y1;
if abs(dy)>abs(dx)
    length=abs(dy);
else
 length=abs(dx);
end
xinc=dx/length;
yinc= dy/length;
x=x1:xinc:x2;
y=y1:yinc:y2;
plot(x,y,'b');
```

```
>> DDA_simple
X1= 4
Y1= -8
X2= -14
Y2= 1
fx >>
```

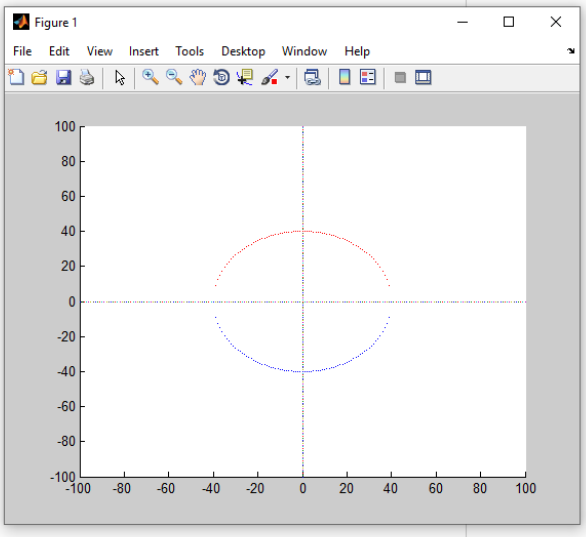
bresnham line .m

```
hold on;
axis ([-100 100 -100 100]);% Range 2D
plot(-100:100,0);% x-axis
plot(0,-100:100);% y-axis
X1 = input('X1= '); Y1 = input('Y1= ');%x1=14,y1=-19
X2 = input('X2= '); Y2 = input('Y2= ');%x2=11,y2=11
dx = X2 - X1;
dy = Y2 - Y1;
if abs(dx) > abs(dy)
   great_axis = dx;
   less_axis = dy;
   great = X1;
   less = Y1;
else
 great_axis = dy;
 less_axis = dx;
 great = Y1;
 less = X1;
end
m = less_axis / great_axis;
er = m - 0.5 * sign(m);
for i = 0 : abs(great_axis)
  if abs(dx) > abs(dy)
    plot (great, less);
  else
    plot (less, great);

  end
  if sign(er) == sign(m)
    less = less + sign(less_axis);
    er = er - 1 * sign(m);
  end
great = great + sign(great_axis);
er = er + m;
end
```



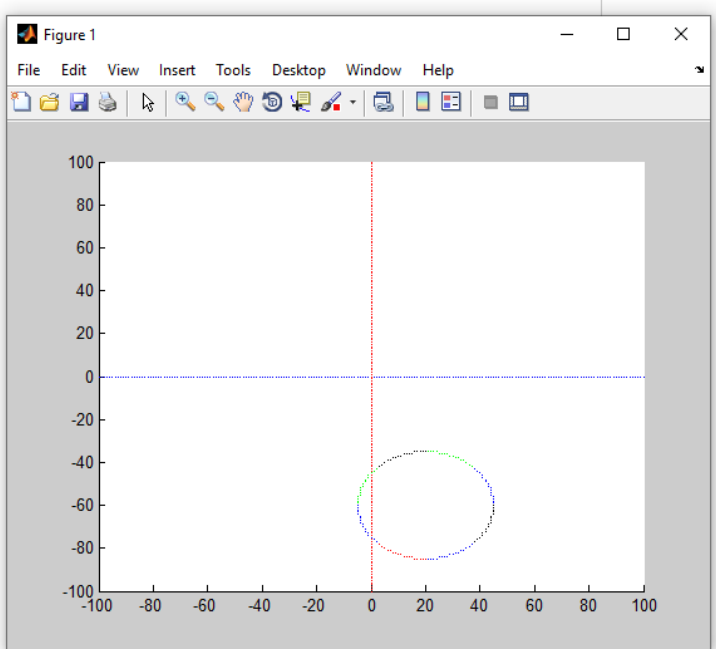
equation circle.m*

```
hold on
axis([-100 100 -100 100])
plot(-100:100,0)
plot(0,-100:100)
yc=input('yc= ')%yc=70
r=input('r= ')%xc=40

for x=-r:r
y1=(r^2-x^2)^0.5;
y2=-(r^2-x^2)^0.5;
plot(x,y1,'r')
plot(x,y2,'b')
end
```



bresnham circle.m*

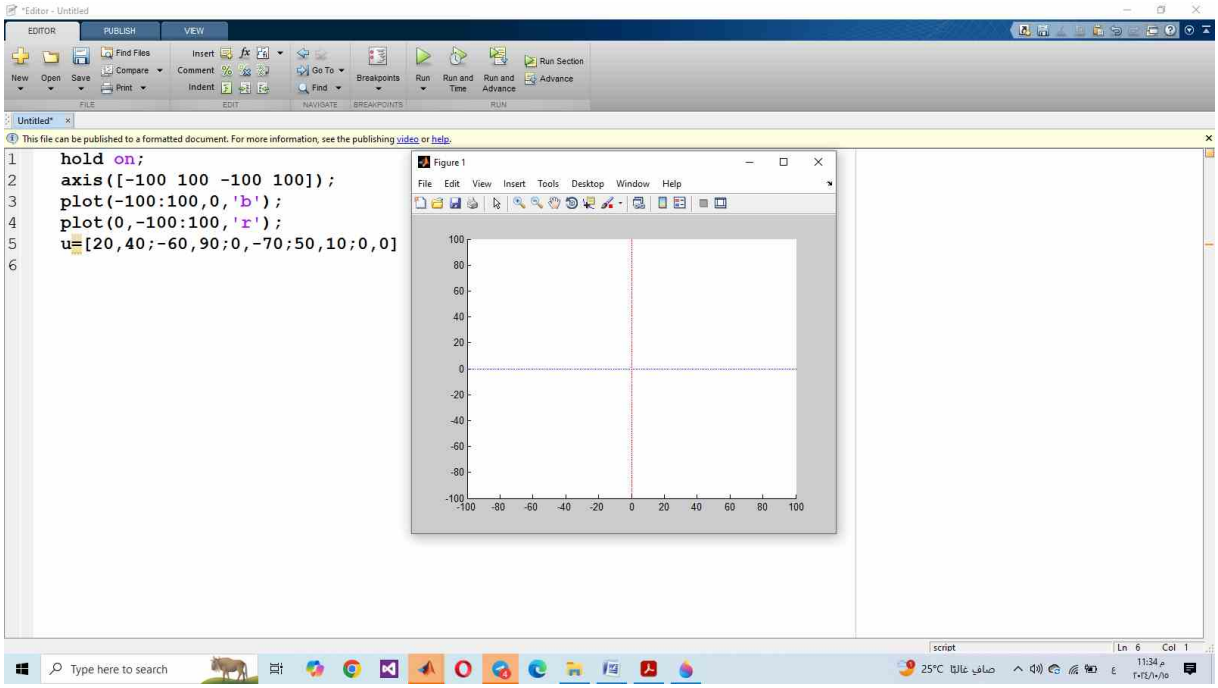
```
hold on;
axis([-100 100 -100 100]);
plot(-100:100,0,'b');
plot(0,-100:100,'r');
xc=input('Xc= ');%Xc= 20,yc= -60,r= 25
yc=input('yc= ');
r=input('r= ');

x=0;y=r;
while x<=y
 plot(xc+x,yc+y,'g');
 plot(xc+x,yc-y,'b');
 plot(xc-x,yc+y,'k');
 plot(xc-x,yc-y,'r');
 plot(xc+y,yc+x,'b');
 plot(xc+y,yc-x,'k');
 plot(xc-y,yc+x,'g');
 plot(xc-y,yc-x,'b');
 da=(x+1)^2+y^2-r^2;
 db=(x+1)^2+(y-1)^2-r^2;
   if abs(db)< abs(da)
    y=y-1;
 end
 x=x+1;
end
```



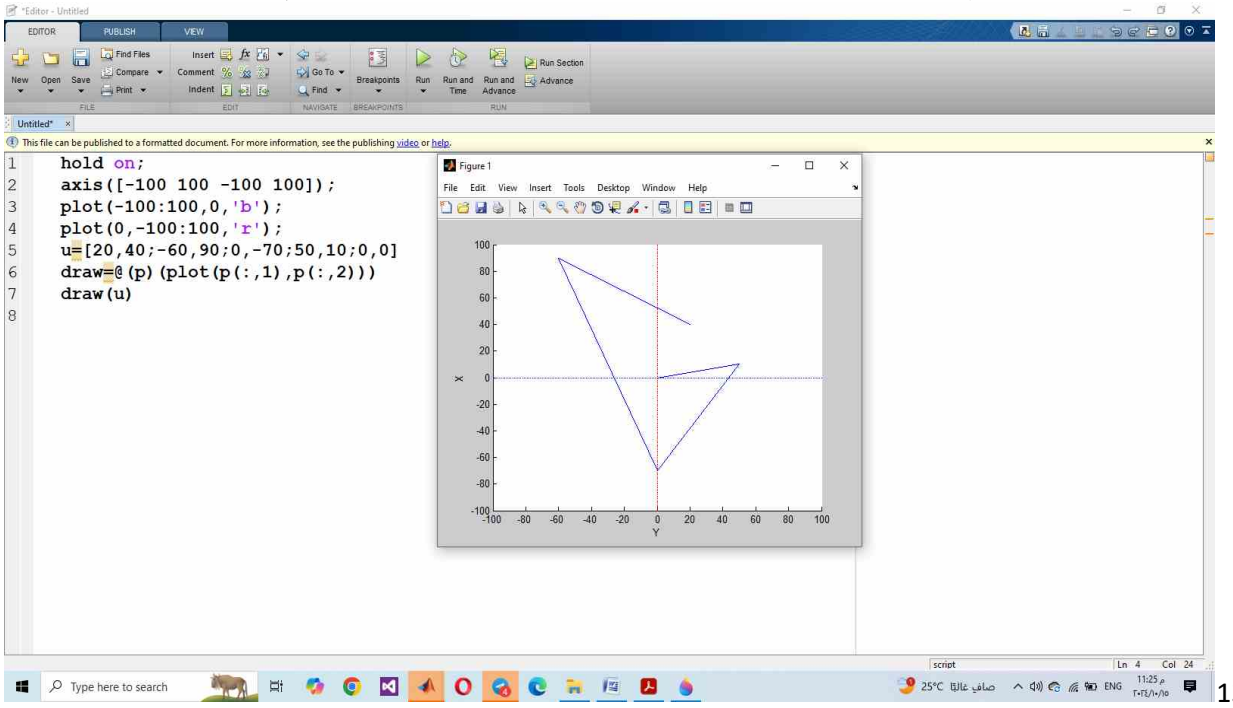
❖ Polar circle واجب

2D Transformation

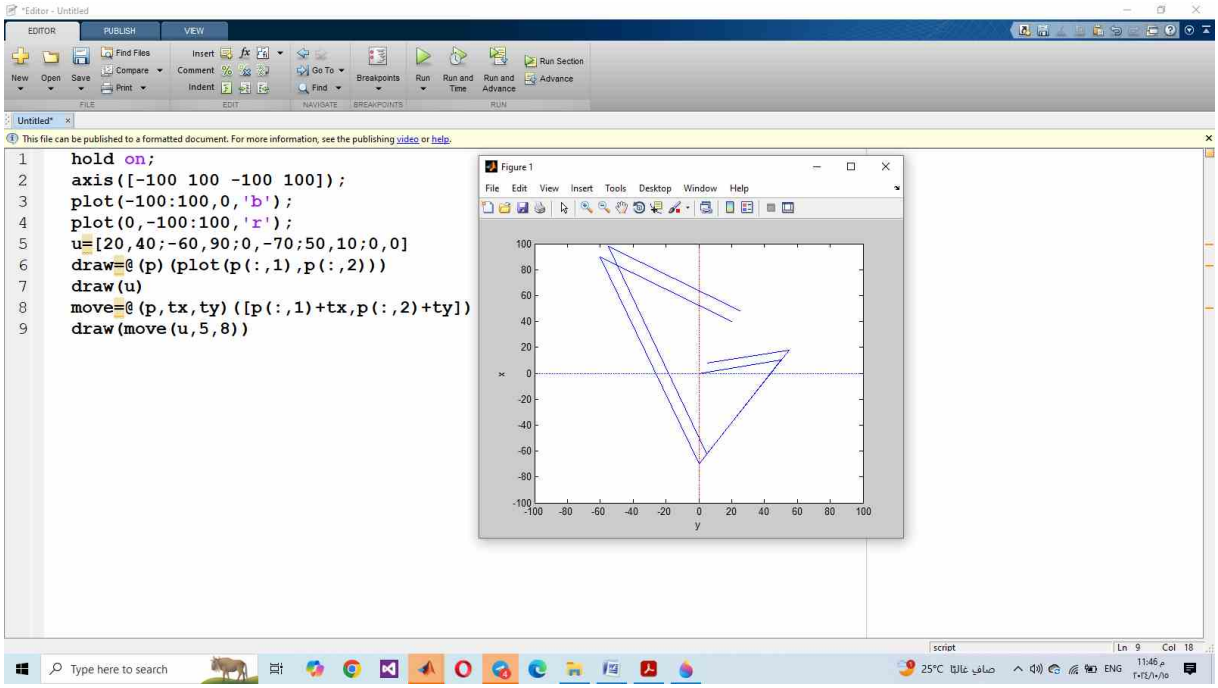
نحدد المحاور ونعرف الشكل المراد رسمه بالمتغير u



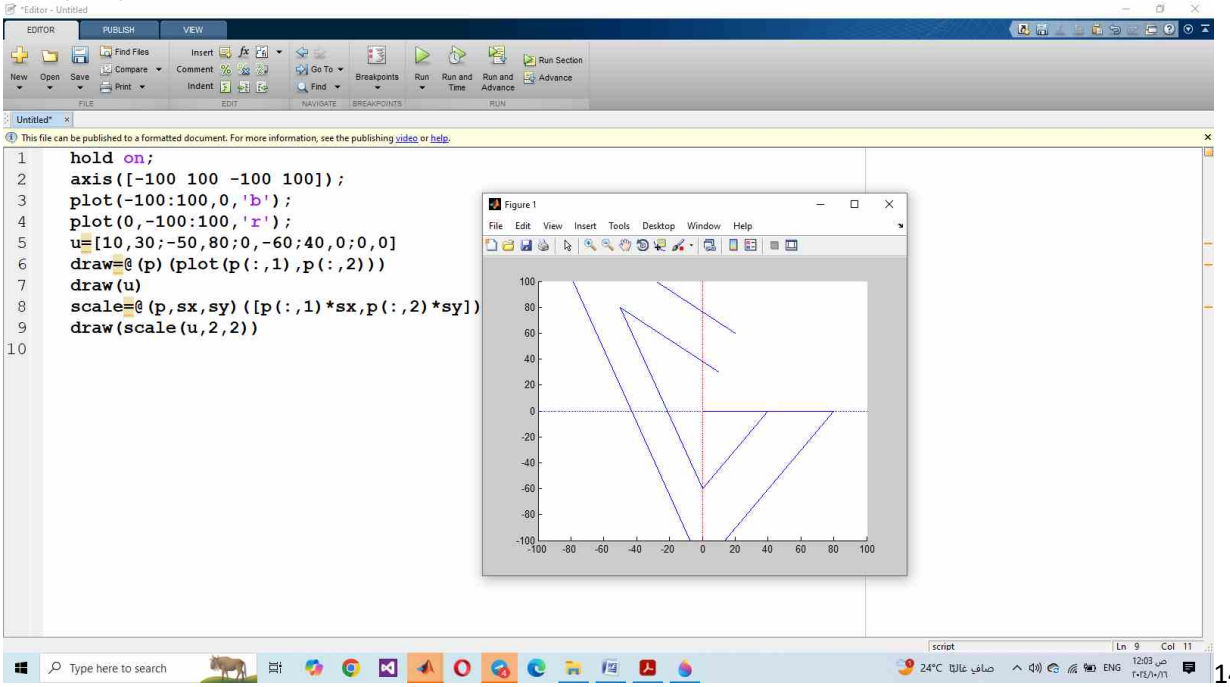
- نرسم الشكل المعرف ب u بدالة ال draw كما مبين في الشكل أدناه



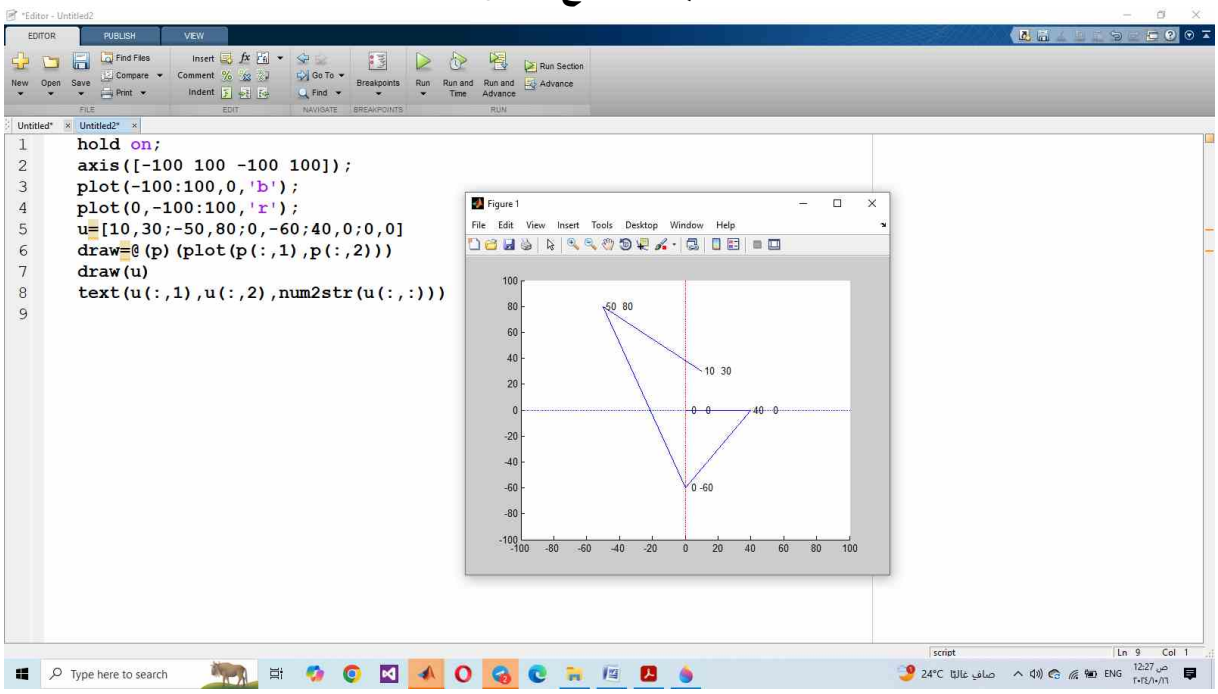
- تحريك الشكل بدالة ال move والمتغيرات عالمحاور x و y



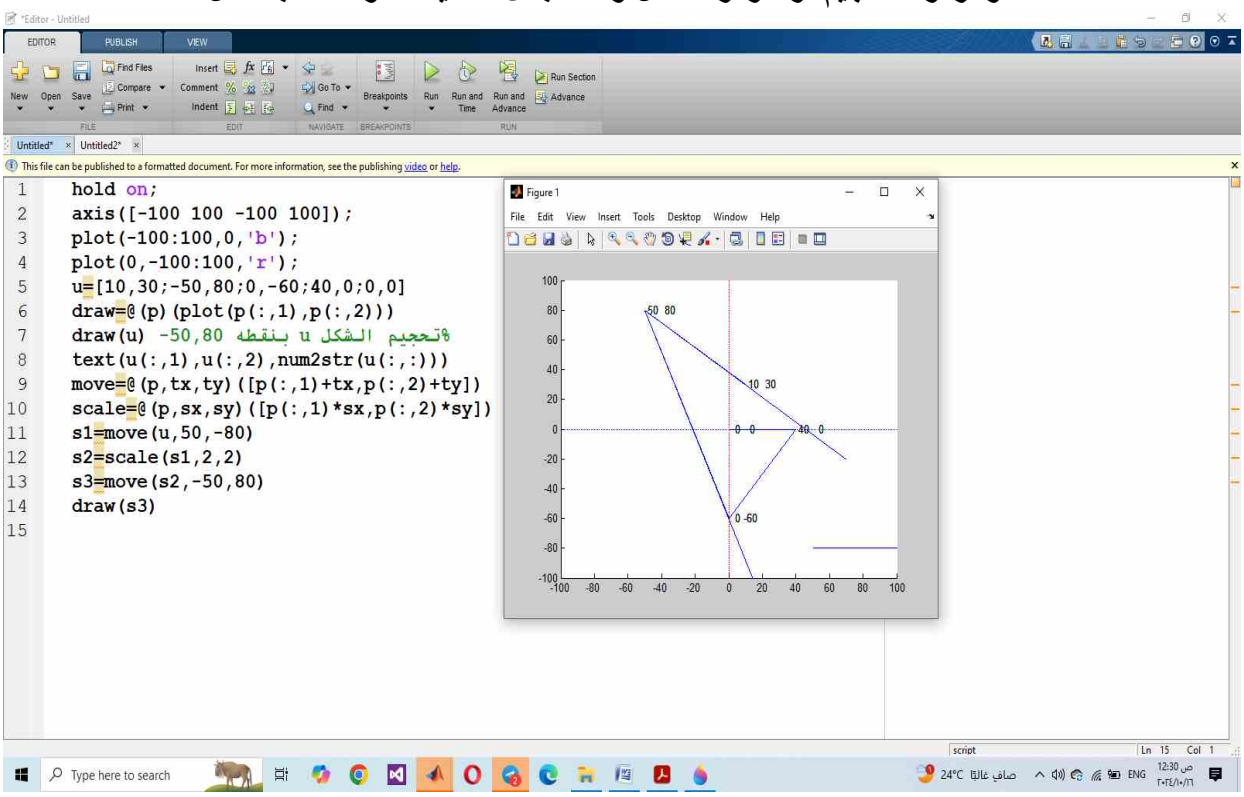
- نحجم الشكل بدالة ال scale والمتغيرات و عالمحاور x و y وعلى نقطه المركز(0,0)

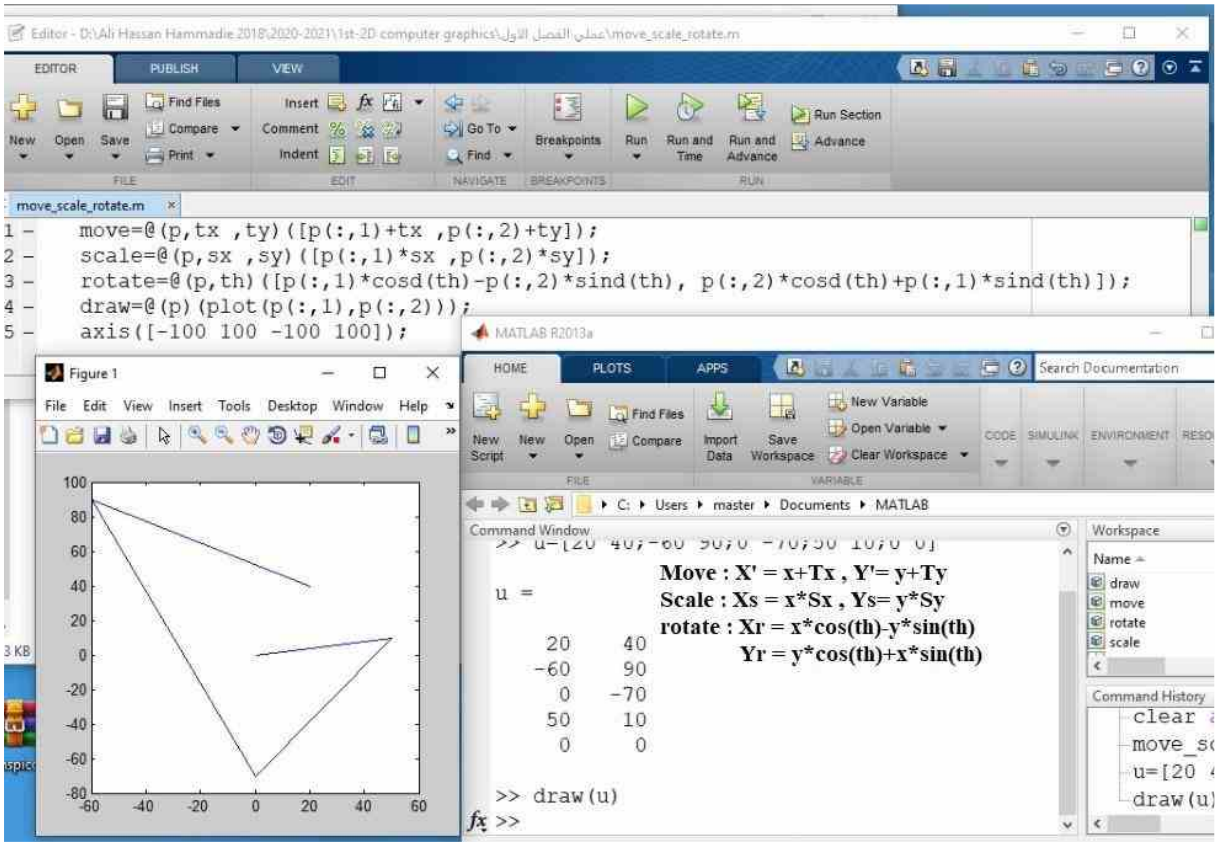


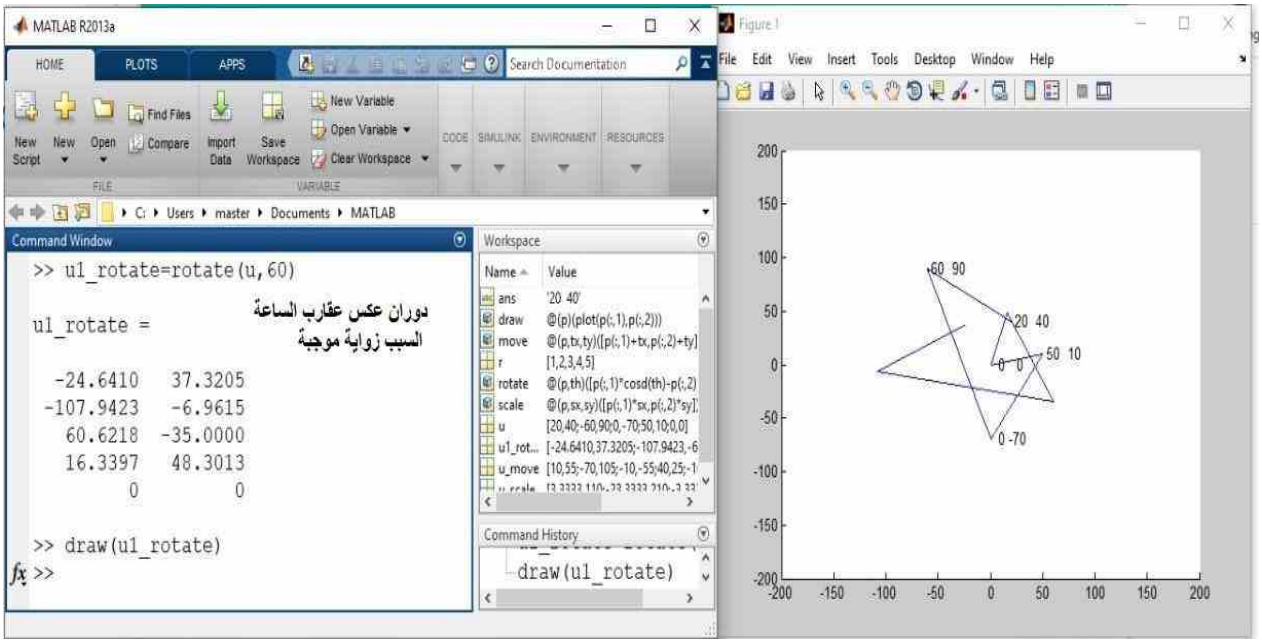
- **كتابه النقاط ع الشكل المحدد**

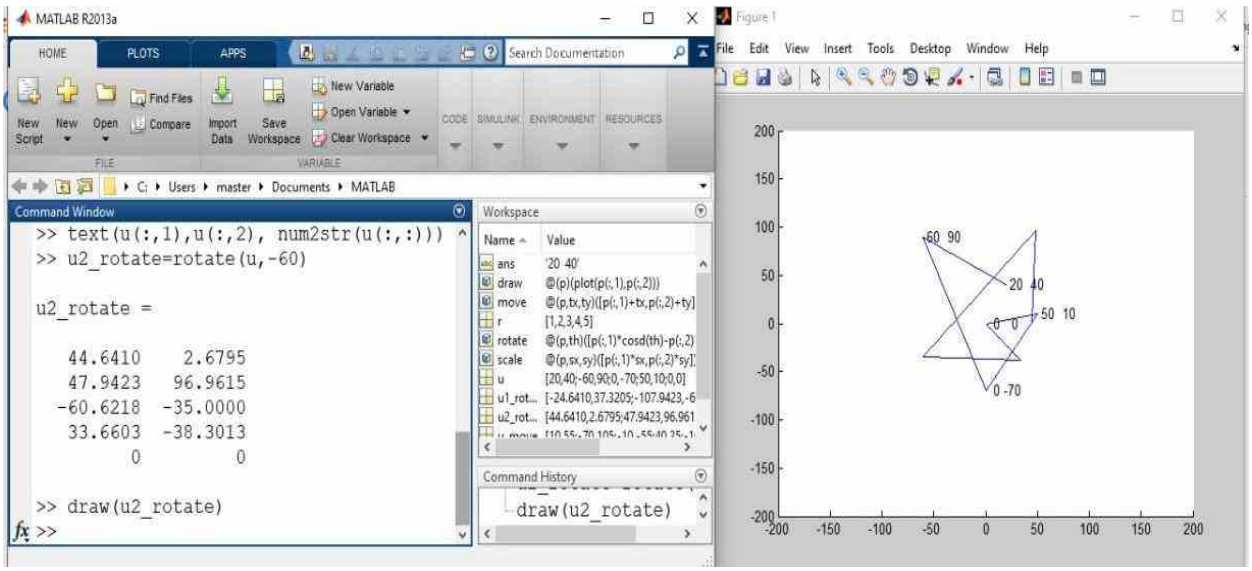


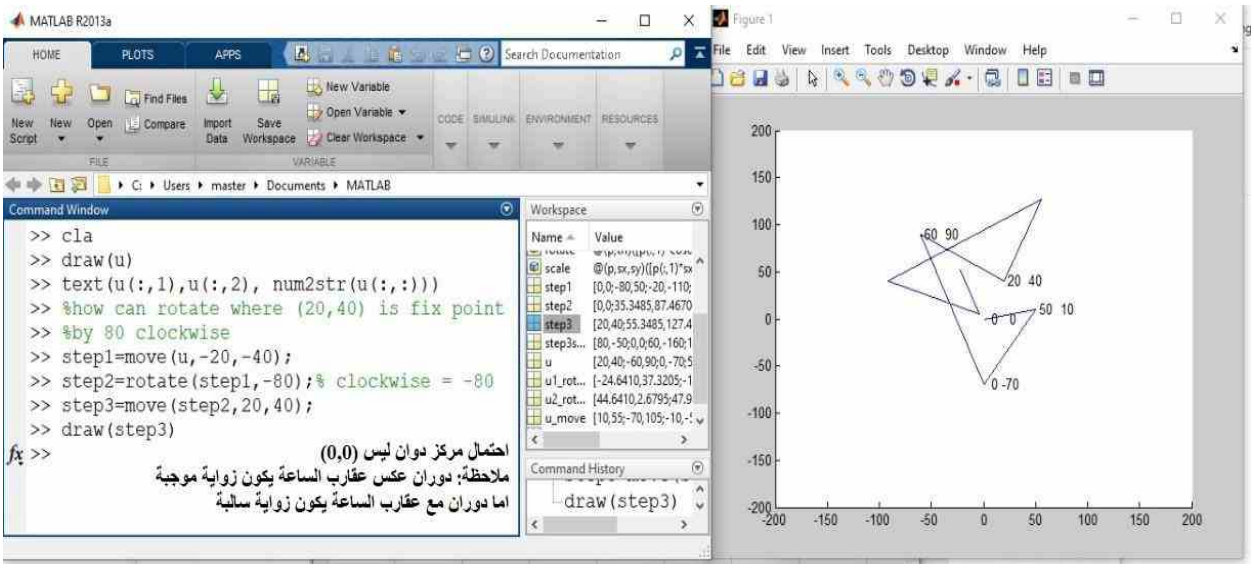
- **نحجم الشكل بدالة ال scale والمتغيرات و عالمحاور x و y وعلى نقطه محددة (fix point) اومركز التحجيم او مركز الشكل وذلك ب 3 عمليات موضحة بالشكل ادناه.**




move=@(p,tx ,ty)([p(:,1)+tx ,p(:,2)+ty]);
scale=@(p,sx ,sy)([p(:,1)*sx ,p(:,2)*sy]);
rotate=@(p,th)([p(:,1)*cosd(th)-p(:,2)*sind(th), p(:,2)*cosd(th)+p(:,1)*sind(th)]);
draw=@(p)(plot(p(:,1),p(:,2)));
axis([-100 100 -100 100]);
Move : X' = x+Tx , Y'= y+Ty
Scale : Xs = x*Sx , Ys= y*Sy
rotate : Xr = x*cos(th)-y*sin(th)
Yr = y*cos(th)+x*sin(th)
u =
20 40
-60 90
0 -70
50 10
0 0
>> draw(u)


>> u1_rotate=rotate(u,60)
u1_rotate =
-24.6410 37.3205
-107.9423 -6.9615
60.6218 -35.0000
16.3397 48.3013
0 0
دوران عكس عقارب الساعة
السبب زاوية موجبة
>> draw(u1_rotate)





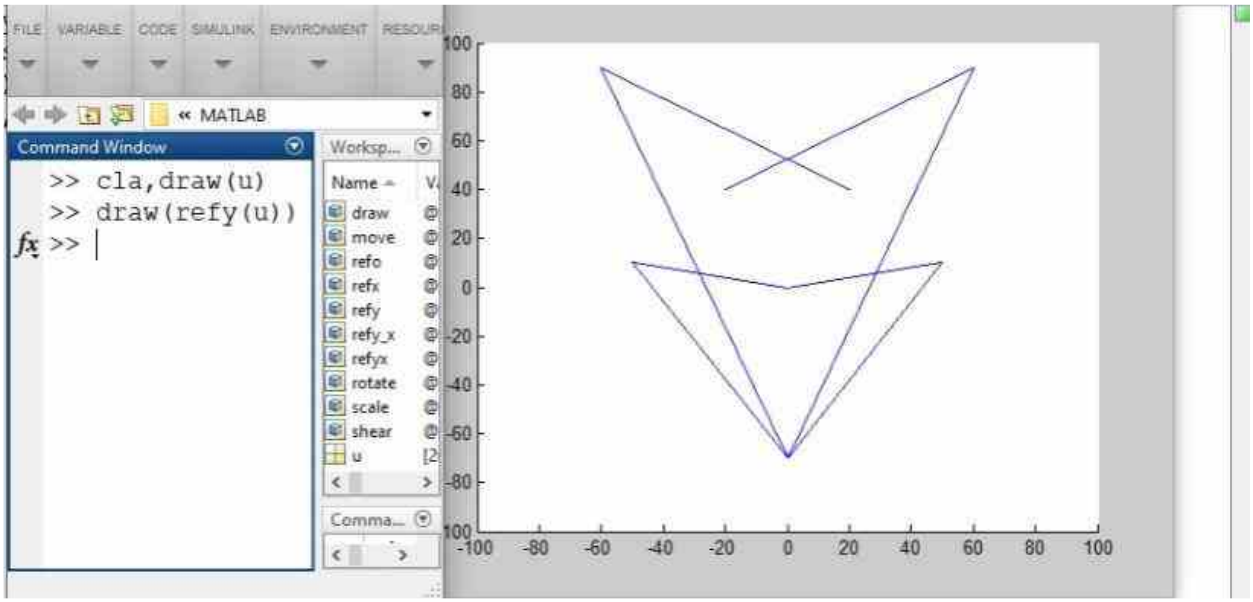
احتمال مركز دوان ليس (0,0)

ملاحظة: دوران عكس عقارب الساعة يكون زوايا موجبة

اما دوران مع عقارب الساعة يكون زوايا سالبة

move_scale_rotate.m

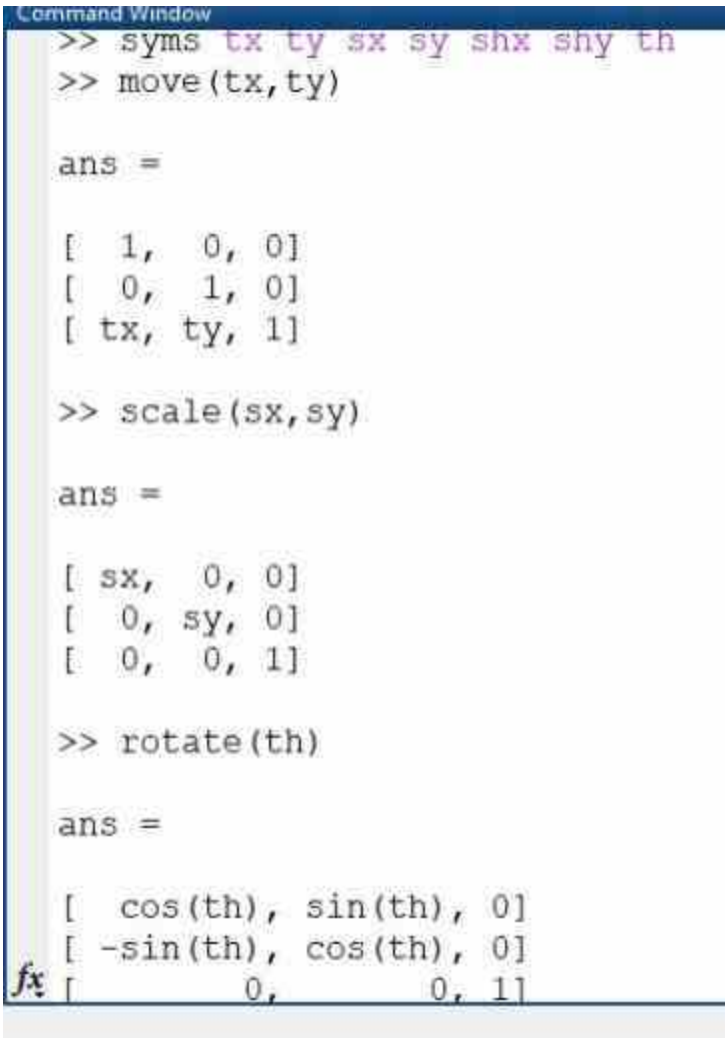
```
move=@(p,tx ,ty)([p(:,1)+tx ,p(:,2)+ty]);
scale=@(p,sx ,sy)([p(:,1)*sx ,p(:,2)*sy]);
rotate=@(p,th)([p(:,1)*cosd(th)-p(:,2)*sind(th), p(:,2)*cosd(th)+p(:,1)*sind(th)]);
shear=@(p,x,shx,shy)([p(:,1)+p(:,2)*shx,p(:,2)+x(:,1)*shy]);
refx=@(p)([p(:,1) ,-p(:,2)]);
refy=@(p)([-p(:,1) ,p(:,2)]);
refo=@(p)([-p(:,1) ,-p(:,2)]);
refyx=@(p)([p(:,2) ,p(:,1)]);
refy_x=@(p)([-p(:,2) ,-p(:,1)]);
draw=@(p)(plot(p(:,1),p(:,2)));
axis([-100 100 -100 100]);
```

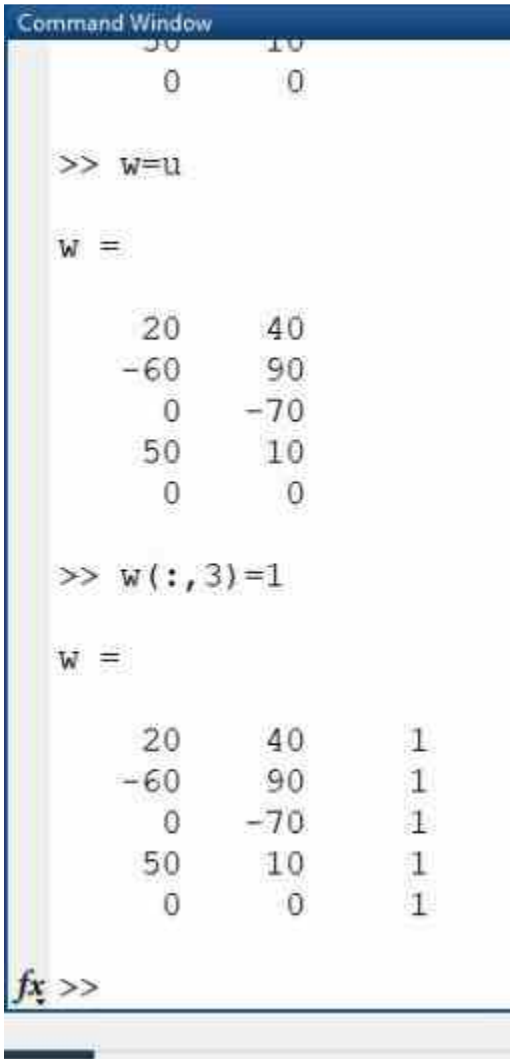


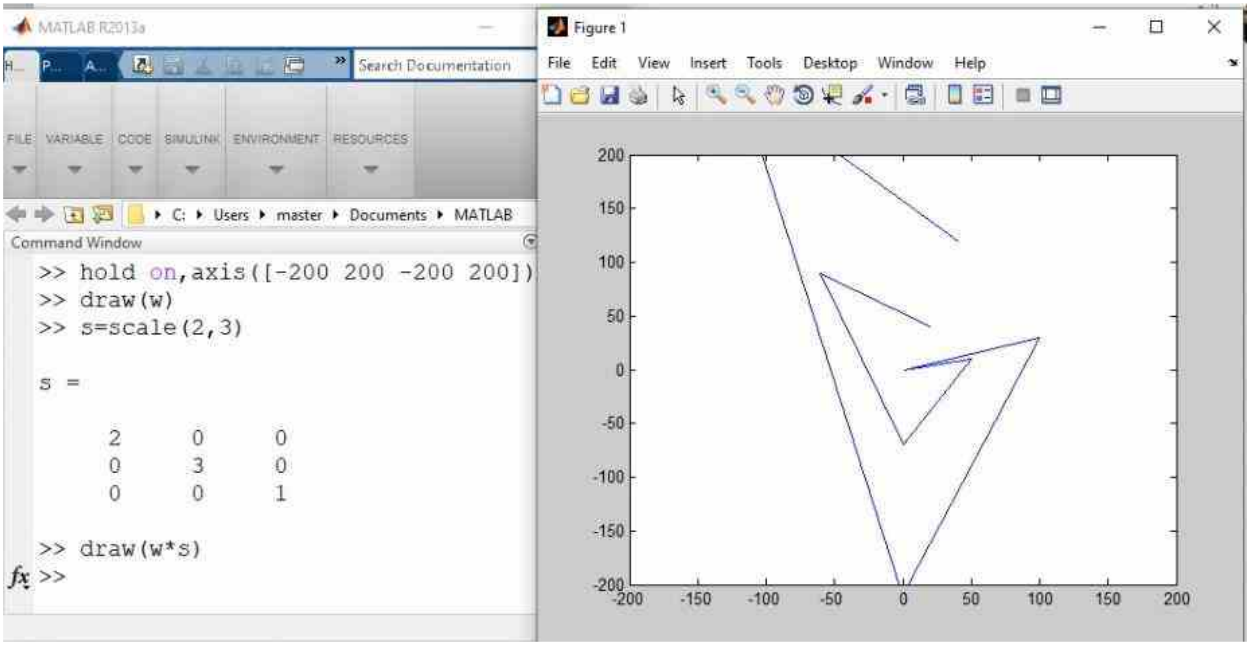
2D Transformation as matrix

Matrix_transform.m | move_scale_rotate_mirror_...

```
draw=@(p)(plot(p(:,1),p(:,2)));% Tool
point=@(p)(text(p(:,1),p(:,2), num2str(p(:,:))));% Tool

move=@(tx ,ty)([1 0 0;0 1 0;tx ty 1]);
scale=@(sx ,sy)([sx 0 0;0 sy 0;0 0 1]);
rotate=@(th)([cosd(th) sind(th) 0;-sind(th) cosd(th) 0;0 0 1]);
shear=@(shx,shy)([1 shy 0;shx 1 0;0 0 1]);
refx=([1 0 0;0 -1 0;0 0 1]);
refy=([-1 0 0;0 1 0;0 0 1]);
refo=([-1 0 0;0 -1 0;0 0 1]);
refyx=([0 1 0;1 0 0;0 0 1]);
refy_x=([0 -1 0;-1 0 0;0 0 1]);
```


Command Window
>> syms tx ty sx sy shx shy th
>> move(tx,ty)
ans =
[1, 0, 0]
[0, 1, 0]
[tx, ty, 1]
>> scale(sx,sy)
ans =
[sx, 0, 0]
[0, sy, 0]
[0, 0, 1]
>> rotate(th)
ans =
[cos(th), sin(th), 0]
[-sin(th), cos(th), 0]
[0, 0, 1]


Command Window
0 0
>> w=u
w =
20 40
-60 90
0 -70
50 10
0 0
>> w(:,3)=1
w =
20 40 1
-60 90 1
0 -70 1
50 10 1
0 0 1
fx >>


MATLAB R2013a
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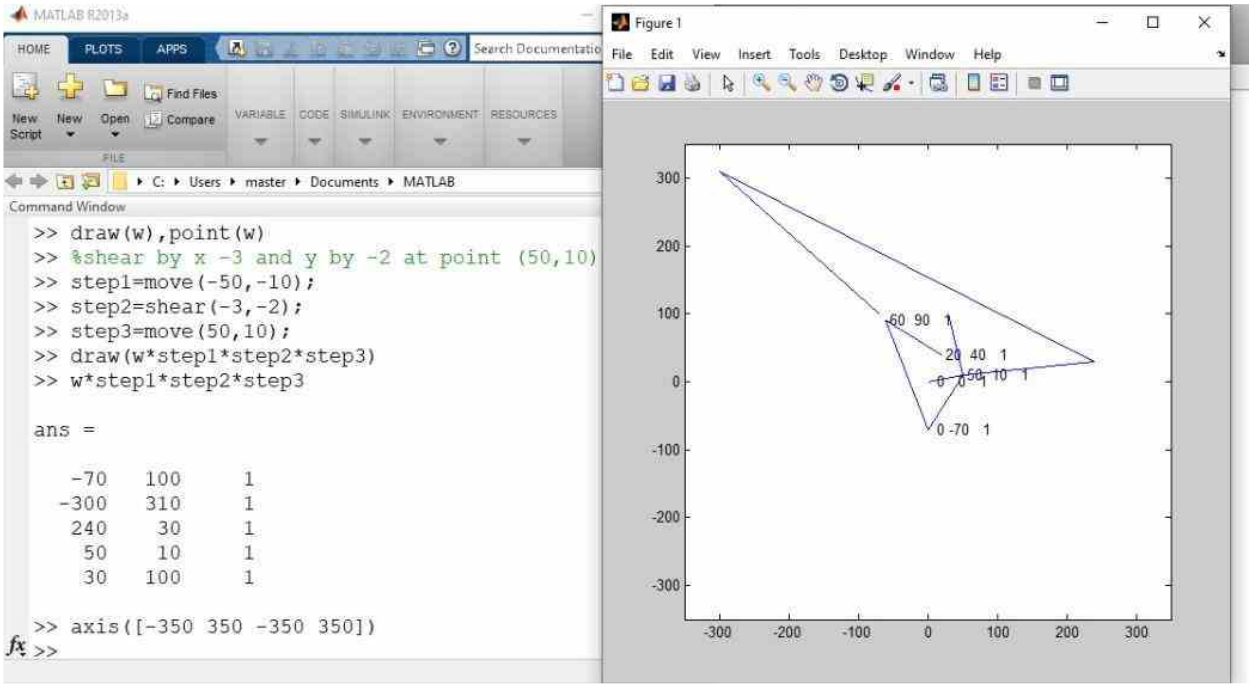
Command Window
>> hold on,axis([-200 200 -200 200])
>> draw(w)
>> s=scale(2,3)
s =
2 0 0
0 3 0
0 0 1
>> draw(w*s)
>>
Figure 1
File Edit View Insert Tools Desktop Window Help
200
150
100
50
0
-50
-100
-150
-200
-200 -150 -100 -50 0 50 100 150 200


MATLAB R2013a
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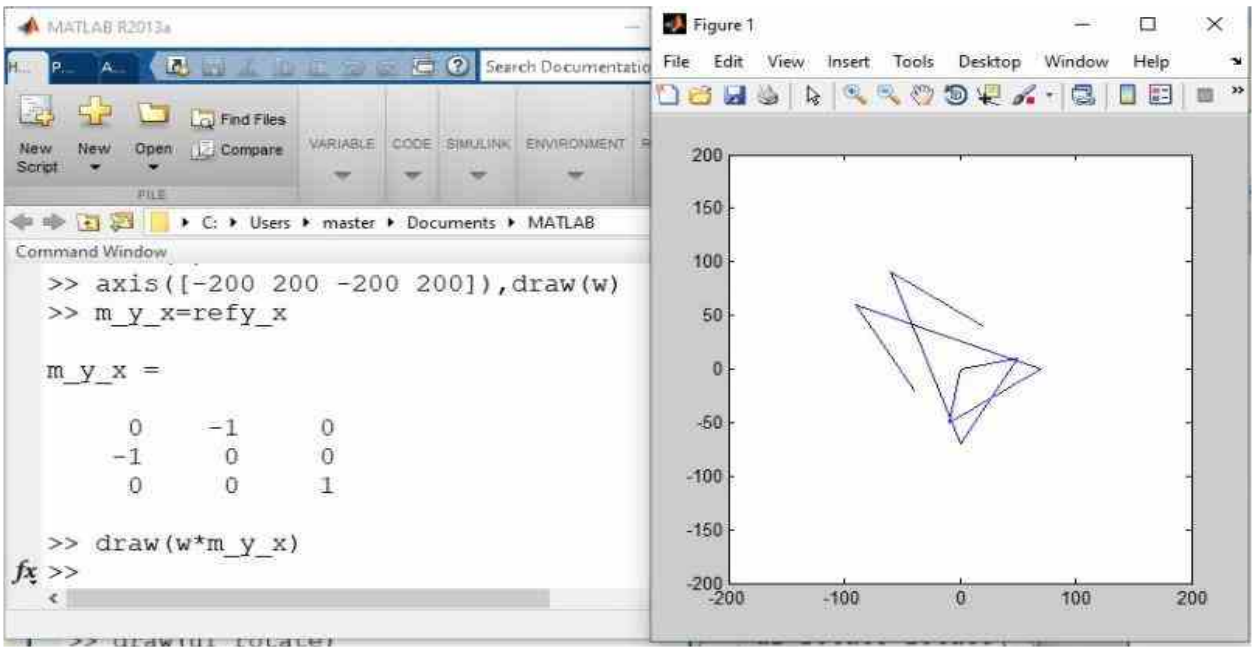
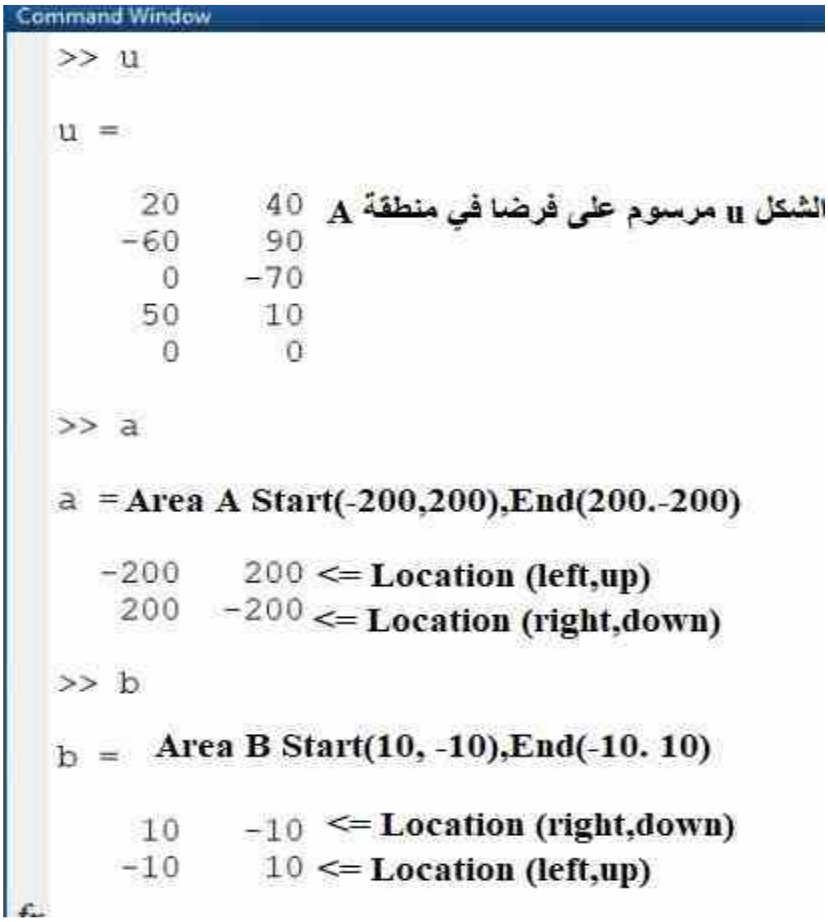
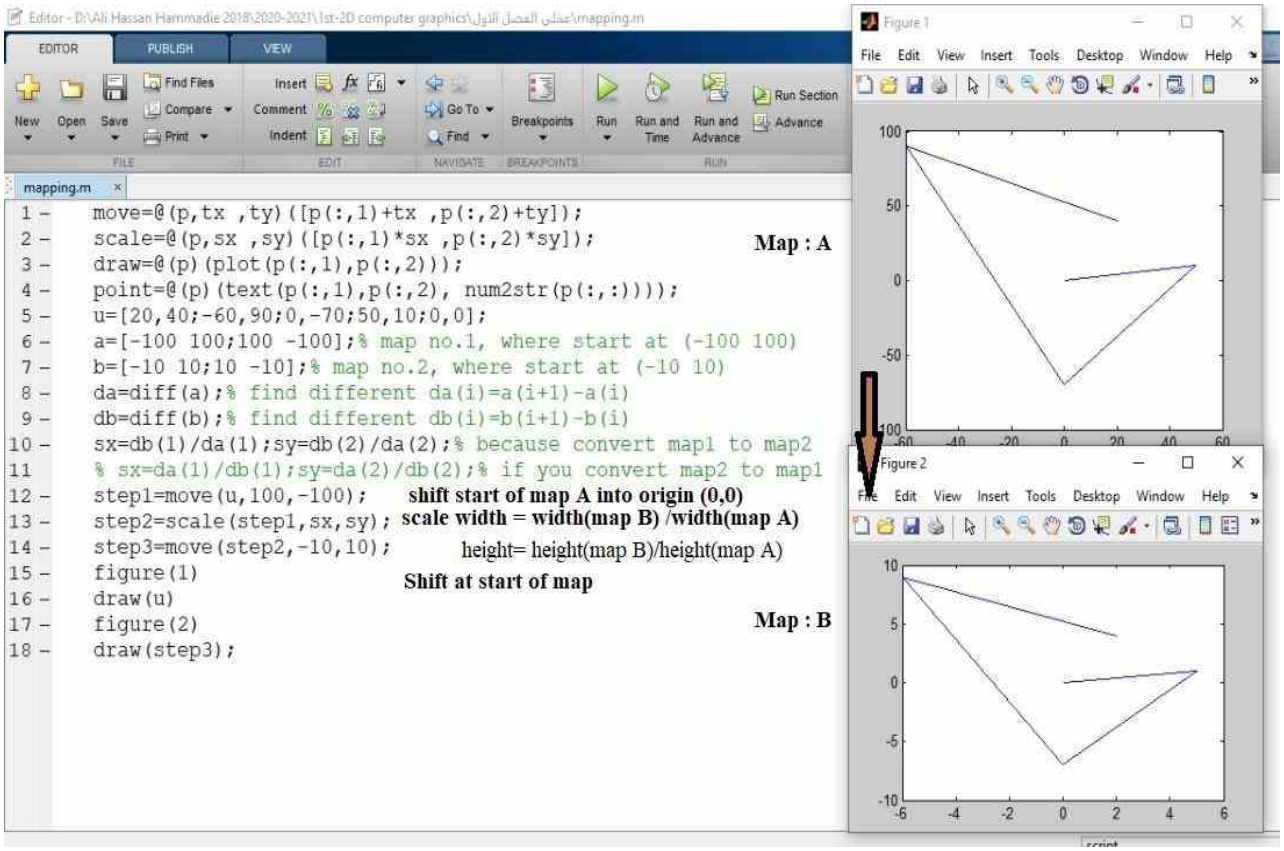
C: Users master Documents MATLAB
Command Window
>> draw(w),point(w)
>> %shear by x -3 and y by -2 at point (50,10)
>> step1=move(-50,-10);
>> step2=shear(-3,-2);
>> step3=move(50,10);
>> draw(w*step1*step2*step3)
>> w*step1*step2*step3
ans =
-70 100 1
-300 310 1
240 30 1
50 10 1
30 100 1
>> axis([-350 350 -350 350])
>>
Figure 1
File Edit View Insert Tools Desktop Window Help
300
200
100
0
-100
-200
-300
-300 -200 -100 0 100 200 300
-60 90 1
20 40 1
0 -70 1



Mapping



الشكل u مرسوم على فرضا في منطقة A

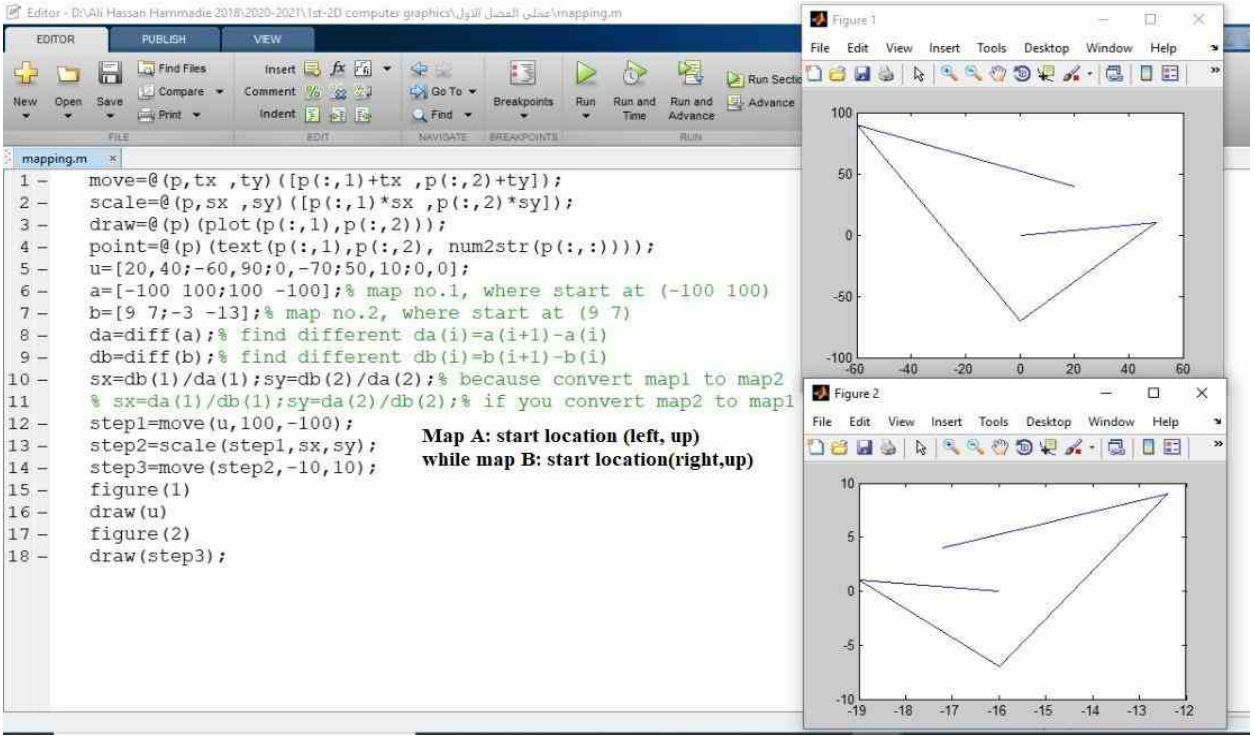


```
move=@(p,tx ,ty)([p(:,1)+tx ,p(:,2)+ty]);
scale=@(p,sx ,sy)([p(:,1)*sx ,p(:,2)*sy]);
draw=@(p)(plot(p(:,1),p(:,2)));
point=@(p)(text(p(:,1),p(:,2), num2str(p(:,:))));
u=[20,40;-60,90;0,-70;50,10;0,0];
a=[-100 100;100 -100];% map no.1, where start at (-100 100)
b=[-10 10;10 -10];% map no.2, where start at (-10 10)
da=diff(a);% find different da(i)=a(i+1)-a(i)
db=diff(b);% find different db(i)=b(i+1)-b(i)
sx=db(1)/da(1);sy=db(2)/da(2);% because convert map1 to map2
% sx=da(1)/db(1);sy=da(2)/db(2);% if you convert map2 to map1
step1=move(u,100,-100);
step2=scale(step1,sx,sy);
step3=move(step2,-10,10);
figure(1)
draw(u)
figure(2)
draw(step3);
```

Map : A

shift start of map A into origin (0,0)
scale width = width(map B) /width(map A)
height= height(map B)/height(map A)
Shift at start of map

Map : B



```
move=@(p,tx ,ty)([p(:,1)+tx ,p(:,2)+ty]);
scale=@(p,sx ,sy)([p(:,1)*sx ,p(:,2)*sy]);
draw=@(p)(plot(p(:,1),p(:,2)));
point=@(p)(text(p(:,1),p(:,2), num2str(p(:,:))));
u=[20,40;-60,90;0,-70;50,10;0,0];
a=[-100 100;100 -100];% map no.1, where start at (-100 100)
b=[9 7;-3 -13];% map no.2, where start at (9 7)
da=diff(a);% find different da(i)=a(i+1)-a(i)
db=diff(b);% find different db(i)=b(i+1)-b(i)
sx=db(1)/da(1);sy=db(2)/da(2);% because convert map1 to map2
% sx=da(1)/db(1);sy=da(2)/db(2);% if you convert map2 to map1
step1=move(u,100,-100);
step2=scale(step1,sx,sy);
step3=move(step2,-10,10);
figure(1)
draw(u)
figure(2)
draw(step3);
```

Map A: start location (left, up)
while map B: start location(right,up)