```
clc;
clear all;
close all;

display('Answer-1')
display('Transformations For Equilateral Triangle')

% Equilateral Triangle Points
x = [0,0];
y = [1,1];
z = [2,0];
display('Original Poins are')
[x' y' z']

figure(1)
axis([-5 5 -5 5])
line([x(1),y(1)],[x(2),y(2)],'color','green');
line([x(1),z(1)],[x(2),z(2)],'color','green');
line([y(1),z(1)],[y(2),z(2)],'color','green');
xlabel('X Axis')
ylabel('Y Axis')
title('Original Triangle')
w=1;
x1=[x';w];
y1=[y';w];
z1=[z';w];
disp('Transformation Matrix is')
t=[1 0 2; 0 1 2; 0 0 1]        %Translation Matrix

x2=t*x1;
y2=t*y1;
z2=t*z1;
disp('Points after Translation')
[x2(1:2) y2(1:2) z2(1:2)]
figure(2)
axis([-5 5 -5 5])
line([x2(1),y2(1)],[x2(2),y2(2)])
line([x2(1),z2(1)],[x2(2),z2(2)])
line([y2(1),z2(1)],[y2(2),z2(2)])
xlabel('X Axis')
ylabel('Y Axis')
title('Translation Result')

 % Euclidian Transformation
 theta= 30;
 disp('Euclidian Transformation Matrix is')
 R=[cos(theta) -sin(theta) 1;sin(theta) cos(theta) 1;0 0 1]  %Euclidean Matrix
 R1=R*x1;
 R2=R*y1;
 R3=R*z1;
 disp('Points after Euclidian Transformation')
```

```
[R1(1:2) R2(1:2) R3(1:2)]
figure(3)
axis([-5 5 -5 5])
line([R1(1),R2(1)],[R1(2),R2(2)])
line([R1(1),R3(1)],[R1(2),R3(2)])
line([R2(1),R3(1)],[R2(2),R3(2)])
xlabel('X Axis')
ylabel('Y Axis')
title('Euclidian Transformation Result')

% Similarity transformation
disp('Similarity Transformation Matrix is')
E=[1 -1 1 ;1 1 1;0 0 1] %similarity Matrix
E1=E*x1;
E2=E*y1;
E3=E*z1;
disp('Points after Similarity Transformation')
[E1(1:2) E2(1:2) E3(1:2)]
figure(4)
axis([-5 5 -5 5])
line([E1(1),E2(1)],[E1(2),E2(2)])
line([E1(1),E3(1)],[E1(2),E3(2)])
line([E2(1),E3(1)],[E2(2),E3(2)])
xlabel('X Axis')
ylabel('Y Axis')
title('Similarity TransformationResult')


% Affine Transformation
disp('Affin Transformation Matrix is')
A=[1 -1 0 ;-2 0 1;0 0 1]
A1=A*x1;
A2=A*y1;
A3=A*z1;
disp('Points after Affine Transformation')
[A1(1:2) A2(1:2) A3(1:2)]
figure(5)
axis([-5 5 -5 5])
line([A1(1),A2(1)],[A1(2),A2(2)])
line([A1(1),A3(1)],[A1(2),A3(2)])
line([A2(1),A3(1)],[A2(2),A3(2)])
xlabel('X Axis')
ylabel('Y Axis')
title('Affine Transformation Result')


%  projective transformation
disp('Projective Transformation Matrix is')
H=[1 2 1;1 1 1;2 2 1]
H1=H*x1;
H2=H*y1;
```

```
H3=H*z1;
disp('Points after Projective Transformation')
[H1(1:2) H2(1:2) H3(1:2)]
figure(6)
axis([-5 5 -5 5])
line([H1(1),H2(1)],[H1(2),H2(2)])
line([H1(1),H3(1)],[H1(2),H3(2)])
line([H2(1),H3(1)],[H2(2),H3(2)])
xlabel('X Axis')
ylabel('Y Axis')
title('Projective Transformation Result')

%%%%%%%%%%% Square Transformations %%%%%%%%%%%%%%%%%%%%%%%%%%%

display('Transformations For Square')
display('Original points are')
a = [0;0];
b = [2;0];
c = [2;2];
d = [0;2];
[a b c d]
figure(7)
axis([-5 5 -5 5])
xlabel('X Axis')
ylabel('Y Axis')
title('Original Figure')
line([a(1),b(1)],[a(2),b(2)]);
line([b(1),c(1)],[b(2),c(2)]);
line([c(1),d(1)],[c(2),d(2)]);
line([d(1),a(1)],[d(2),a(2)]);
w=1;
a1=[a;w];
b1=[b;w];
c1=[c;w];
d1=[d;w];
display('Transformation Matrix is')
t = [1 0 2 ; 0 1 2 ; 0 0 1] %translation
t1=t*a1;
t2=t*b1;
t3=t*c1;
t4=t*d1;
disp('Points after Translation')
[t1(1:2) t2(1:2) t3(1:2) t4(1:2)]
figure(8)
axis([-5 5 -5 5])
line([t1(1),t2(1)],[t1(2),t2(2)]);
line([t2(1),t3(1)],[t2(2),t3(2)]);
line([t3(1),t4(1)],[t3(2),t4(2)]);
line([t4(1),t1(1)],[t4(2),t1(2)]);
xlabel('X Axis')
ylabel('Y Axis')
```

```
title('Translation Result')

%Euclidian Transformation
theta = 30;
display('Euclidian Transformation Matrix is')
R=[cos(theta) -sin(theta) 1;sin(theta) cos(theta) 1;0 0 1] %
euclidean=translation+rotation
R1=R*a1;
R2=R*b1;
R3=R*c1;
R4=R*d1;
disp('Points after Euclidian Transformation')
[R1(1:2) R2(1:2) R3(1:2) R4(1:2)]
figure(9)
axis([-5 5 -5 5])
xlabel('X Axis')
ylabel('Y Axis')
title('Euclidean Transformation Result')
line([R1(1),R2(1)],[R1(2),R2(2)]);
line([R2(1),R3(1)],[R2(2),R3(2)]);
line([R3(1),R4(1)],[R3(2),R4(2)]);
line([R4(1),R1(1)],[R4(2),R1(2)]);

%similarity transform
display('Similarity Transformation Matrix is')
E = [ 1 -1 1 ; 1 1 1 ; 0 0 1]
E1=E*a1;
E2=E*b1;
E3=E*c1;
E4=E*d1;
disp('Points after Similarity Transformation')
[E1(1:2) E2(1:2) E3(1:2) E4(1:2)]
figure(10)
axis([-5 5 -5 5])
xlabel('X Axis')
ylabel('Y Axis')
title('Similarity TransformationResult')
line([E1(1),E2(1)],[E1(2),E2(2)]);
line([E2(1),E3(1)],[E2(2),E3(2)]);
line([E3(1),E4(1)],[E3(2),E4(2)]);
line([E4(1),E1(1)],[E4(2),E1(2)])

% AFFINE Transformation
disp('Affin Transformation Matrix is')
A=[1 -1 0 ; -2 0 1 ; 0 0 1]
A1=A*a1;
A2=A*b1;
A3=A*c1;
A4=A*d1;
disp('Points after Affine Transformation')
[A1(1:2) A2(1:2) A3(1:2) A4(1:2)]
```

```
figure(11)
axis([-5 5 -5 5])
xlabel('X Axis')
ylabel('Y Axis')
title('Affine TransformationResult')
line([A1(1),A2(1)],[A1(2),A2(2)]);
line([A2(1),A3(1)],[A2(2),A3(2)]);
line([A3(1),A4(1)],[A3(2),A4(2)]);
line([A4(1),A1(1)],[A4(2),A1(2)]);

%projective transformation
disp('Projective Transformation Matrix is')
P =[1 2 1;1 1 1;2 2 1]
P1=P*a1;
P2=P*b1;
P3=P*c1;
P4=P*d1;
disp('Points after Projective Transformation')
[P1(1:2) P2(1:2) P3(1:2) P4(1:2)]
figure(12)
axis([-10 10 -10 10])
xlabel('X Axis')
ylabel('Y Axis')
title('Projective Transformation Result')
line([P1(1),P2(1)],[P1(2),P2(2)]);
line([P2(1),P3(1)],[P2(2),P3(2)]);
line([P3(1),P4(1)],[P3(2),P4(2)])
line([P4(1),P1(1)],[P4(2),P1(2)])

%%%%%%%%%%%%%%% Hexagon Transformation %%%%%%%%%%%%%%%%%%%%%%%%%%%%

display('Hexagon Transformation')
a = [1;0];
b = [2;0];
c = [2.5;1];
d = [2;2];
e = [1;2];
f = [0.5;1];
display('Original Poins are')
[a b c d e f]
figure(13)
axis([0 5 0 5])
xlabel('X Axis')
ylabel('Y Axis')
title('Original Figure')
line([a(1),b(1)],[a(2),b(2)]);
line([b(1),c(1)],[b(2),c(2)]);
line([c(1),d(1)],[c(2),d(2)]);
line([d(1),e(1)],[d(2),e(2)]);
line([e(1),f(1)],[e(2),f(2)]);
line([f(1),a(1)],[f(2),a(2)]);
```

```
w=1;
a1=[a;w];
b1=[b;w];
c1=[c;w];
d1=[d;w];
e1=[e;w];
f1=[f;w];

% Translation
disp('Transformation Matrix is')
t = [1 0 2 ; 0 1 2 ; 0 0 1] %translation
t1=t*a1;
t2=t*b1;
t3=t*c1;
t4=t*d1;
t5=t*e1;
t6=t*f1;
disp('Points after Translation')
[t1(1:2) t2(1:2) t3(1:2) t4(1:2) t5(1:2) t6(1:2)]

figure(14)
axis([-5 5 -5 5])
xlabel('X Axis')
ylabel('Y Axis')
title('Translation Result')
line([t1(1),t2(1)],[t1(2),t2(2)]);
line([t2(1),t3(1)],[t2(2),t3(2)]);
line([t3(1),t4(1)],[t3(2),t4(2)]);
line([t4(1),t5(1)],[t4(2),t5(2)]);
line([t5(1),t6(1)],[t5(2),t6(2)]);
line([t6(1),t1(1)],[t6(2),t1(2)]);

% Euclidian Transformation
theta= 30;
disp('Euclidian Transformation Matrix is')
R=[cos(theta) -sin(theta) 1;sin(theta) cos(theta) 1;0 0 1]%
euclidean=translation+rotation
R1=R*a1;
R2=R*b1;
R3=R*c1;
R4=R*d1;
R5=R*e1;
R6=R*f1;
disp('Points after Euclidian Transformation')
[R1(1:2) R2(1:2) R3(1:2) R4(1:2) R5(1:2) R6(1:2)]
figure(15)
axis([-5 5 -5 5])
xlabel('X Axis')
ylabel('Y Axis')
title('Euclidean TransformationResult')
line([R1(1),R2(1)],[R1(2),R2(2)]);
```

```
line([R2(1),R3(1)],[R2(2),R3(2)]);
line([R3(1),R4(1)],[R3(2),R4(2)]);
line([R4(1),R5(1)],[R4(2),R5(2)]);
line([R5(1),R6(1)],[R5(2),R6(2)]);
line([R6(1),R1(1)],[R6(2),R1(2)]);

%similarity transform
disp('Similarity Transformation Matrix is')
E = [ 1 -1 1 ; 1 1 1 ; 0 0 1]
E1=E*a1;
E2=E*b1;
E3=E*c1;
E4=E*d1;
E5=E*e1;
E6=E*f1;
disp('Points after Similarity Translation')
[E1(1:2) E2(1:2) E3(1:2) E4(1:2) E5(1:2) E6(1:2)]
figure(16)
axis([-5 5 -5 5])
xlabel('X Axis')
ylabel('Y Axis')
title('Similarity Transformation Result')
line([E1(1),E2(1)],[E1(2),E2(2)]);
line([E2(1),E3(1)],[E2(2),E3(2)]);
line([E3(1),E4(1)],[E3(2),E4(2)]);
line([E4(1),E5(1)],[E4(2),E5(2)]);
line([E5(1),E6(1)],[E5(2),E6(2)]);
line([E6(1),E1(1)],[E6(2),E1(2)]);

% AFFINE Transformation
disp('Affine Transformation Matrix is')
A=[1 -1 0 ; -2 0 1 ; 0 0 1]
A1=A*a1;
A2=A*b1;
A3=A*c1;
A4=A*d1;
A5=A*e1;
A6=A*f1;
disp('Points after Affine Transformation')
[A1(1:2) A2(1:2) A3(1:2) A4(1:2) A5(1:2) A6(1:2)]
figure(17)
axis([-5 5 -5 5])
xlabel('X Axis')
ylabel('Y Axis')
title('Affine Transformation Result')
line([A1(1),A2(1)],[A1(2),A2(2)]);
line([A2(1),A3(1)],[A2(2),A3(2)]);
line([A3(1),A4(1)],[A3(2),A4(2)]);
line([A4(1),A5(1)],[A4(2),A5(2)]);
line([A5(1),A6(1)],[A5(2),A6(2)]);
line([A6(1),A1(1)],[A6(2),A1(2)]);
```

```
%projective transformation
disp('Projective Transformation Matrix is')
P = [1 2 1;1 1 1;2 2 1]
P1=P*a1;
P2=P*b1;
P3=P*c1;
P4=P*d1;
P5=P*e1;
P6=P*f1;
disp('Points after Projective Transformation')
[P1(1:2) P2(1:2) P3(1:2) P4(1:2) P5(1:2) P6(1:2)]
figure(18)
axis([-10 10 -10 10])
xlabel('X Axis')
ylabel('Y Axis')
title('Projective Result')
line([P1(1),P2(1)],[P1(2),P2(2)]);
line([P2(1),P3(1)],[P2(2),P3(2)]);
line([P3(1),P4(1)],[P3(2),P4(2)])
line([P4(1),P5(1)],[P4(2),P5(2)]);
line([P5(1),P6(1)],[P5(2),P6(2)]);
line([P6(1),P1(1)],[P6(2),P1(2)]);
```

```
Answer-1
Transformations For Equilateral Triangle
Original Poins are

ans =

     0     1     2
     0     1     0

Transformation Matrix is

t =

     1     0     2
     0     1     2
     0     0     1

Points after Translation

ans =

     2     3     4
     2     3     2
```

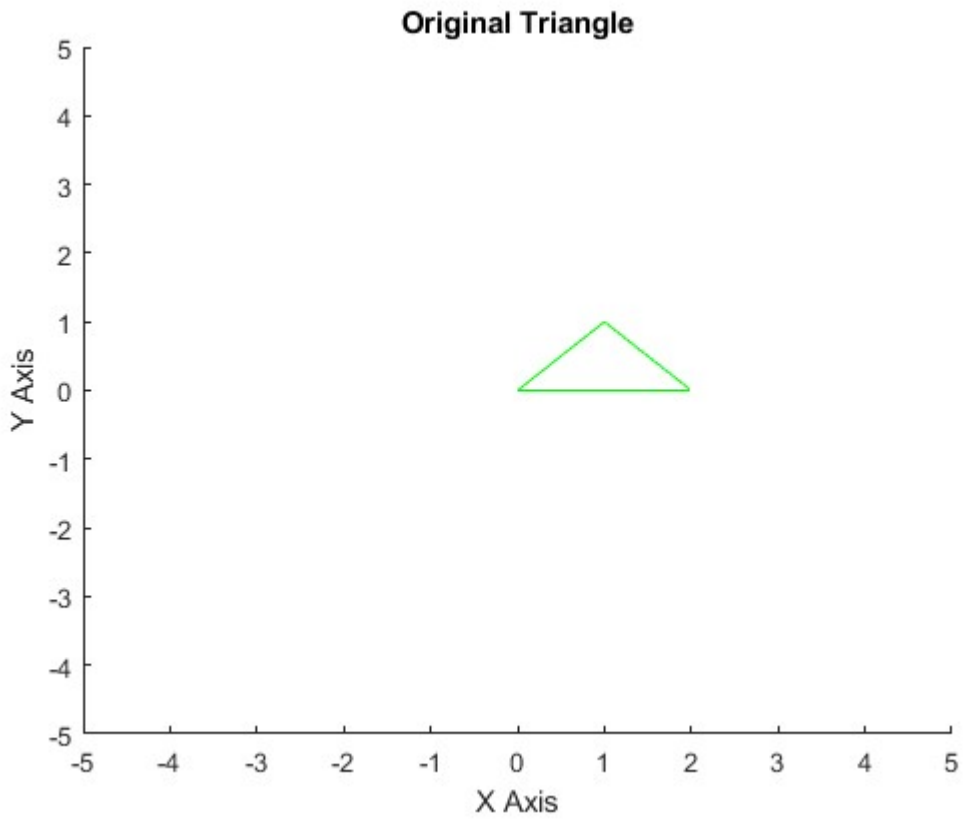
```
Euclidian Transformation Matrix is

R =

    0.1543    0.9880    1.0000
   -0.9880    0.1543    1.0000
         0         0    1.0000

Points after Euclidian Transformation

ans =

    1.0000    2.1423    1.3085
    1.0000    0.1662   -0.9761

Similarity Transformation Matrix is

E =

     1    -1     1
     1     1     1
     0     0     1

Points after Similarity Transformation

ans =

     1     1     3
     1     3     3

Affin Transformation Matrix is

A =

     1    -1     0
    -2     0     1
     0     0     1

Points after Affine Transformation

ans =

     0     0     2
     1    -1    -3

Projective Transformation Matrix is

H =

     1     2     1
     1     1     1
```

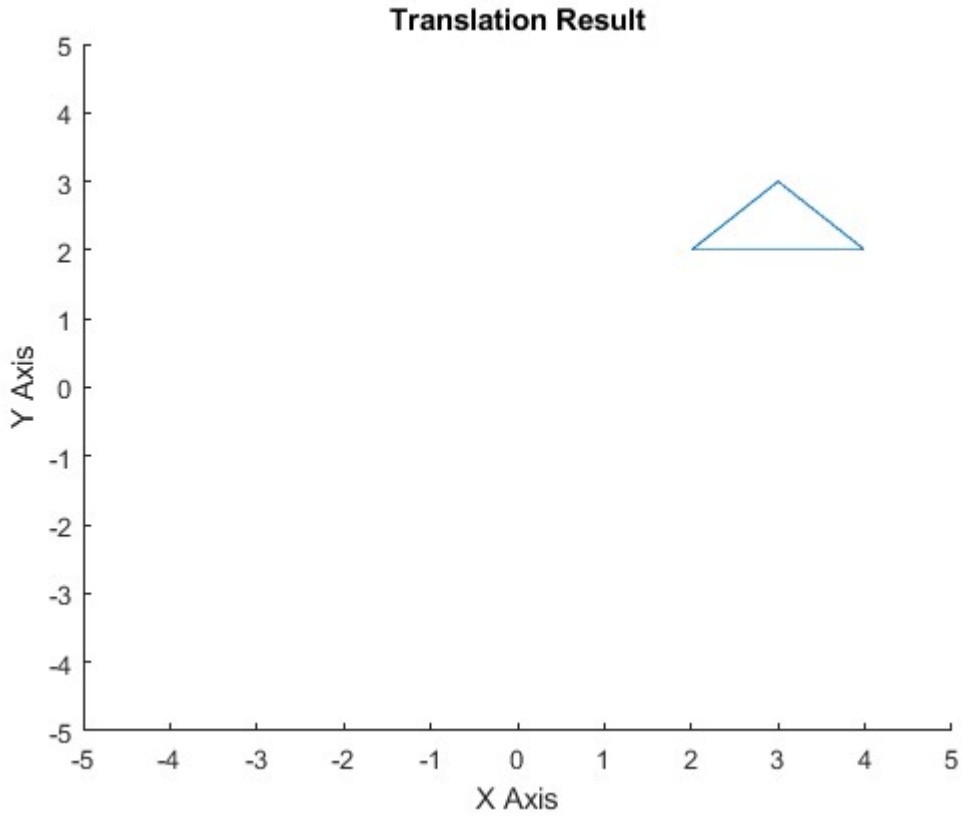
```
     2     2     1

Points after Projective Transformation

ans =

     1     4     3
     1     3     3

Transformations For Square
Original points are

ans =

     0     2     2     0
     0     0     2     2

Transformation Matrix is

t =

     1     0     2
     0     1     2
     0     0     1

Points after Translation

ans =

     2     4     4     2
     2     2     4     4

Euclidian Transformation Matrix is

R =

    0.1543    0.9880    1.0000
   -0.9880    0.1543    1.0000
         0         0    1.0000

Points after Euclidian Transformation

ans =

    1.0000    1.3085    3.2846    2.9761
    1.0000   -0.9761   -0.6676    1.3085

Similarity Transformation Matrix is

E =
```

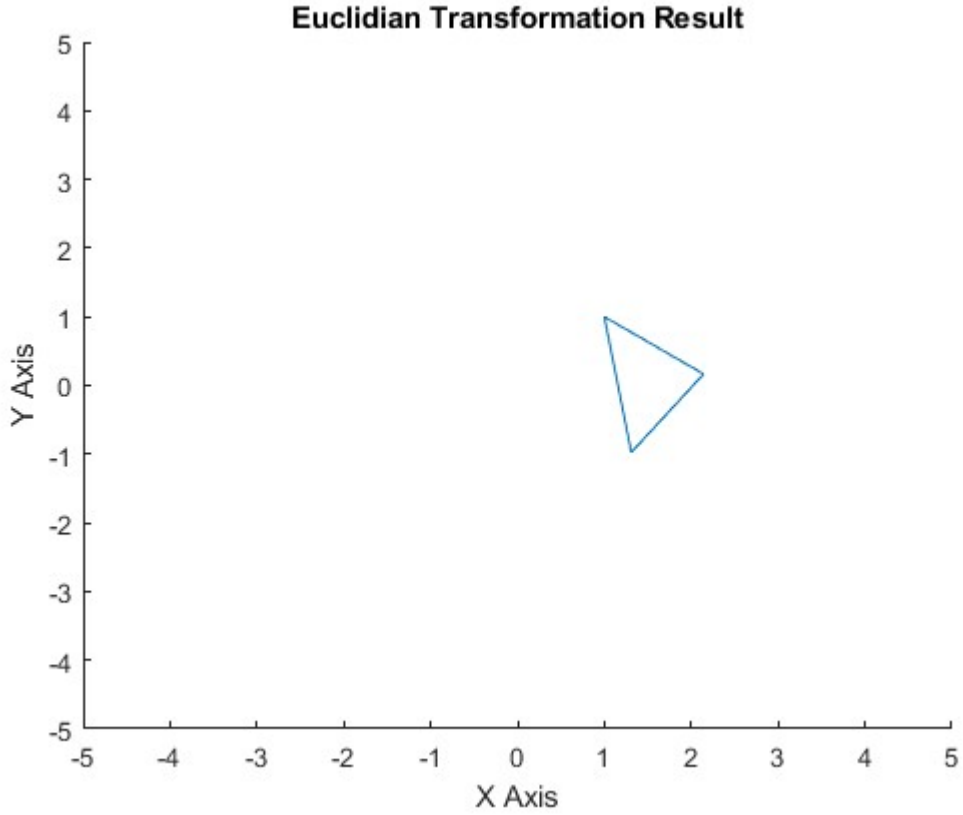
```
     1    -1     1
     1     1     1
     0     0     1

Points after Similarity Transformation

ans =

     1     3     1    -1
     1     3     5     3

Affin Transformation Matrix is

A =

     1    -1     0
    -2     0     1
     0     0     1

Points after Affine Transformation

ans =

     0     2     0    -2
     1    -3    -3     1

Projective Transformation Matrix is

P =

     1     2     1
     1     1     1
     2     2     1

Points after Projective Transformation

ans =

     1     3     7     5
     1     3     5     3

Hexagon Transformation
Original Poins are

ans =

    1.0000    2.0000    2.5000    2.0000    1.0000    0.5000
         0         0    1.0000    2.0000    2.0000    1.0000

Transformation Matrix is
```

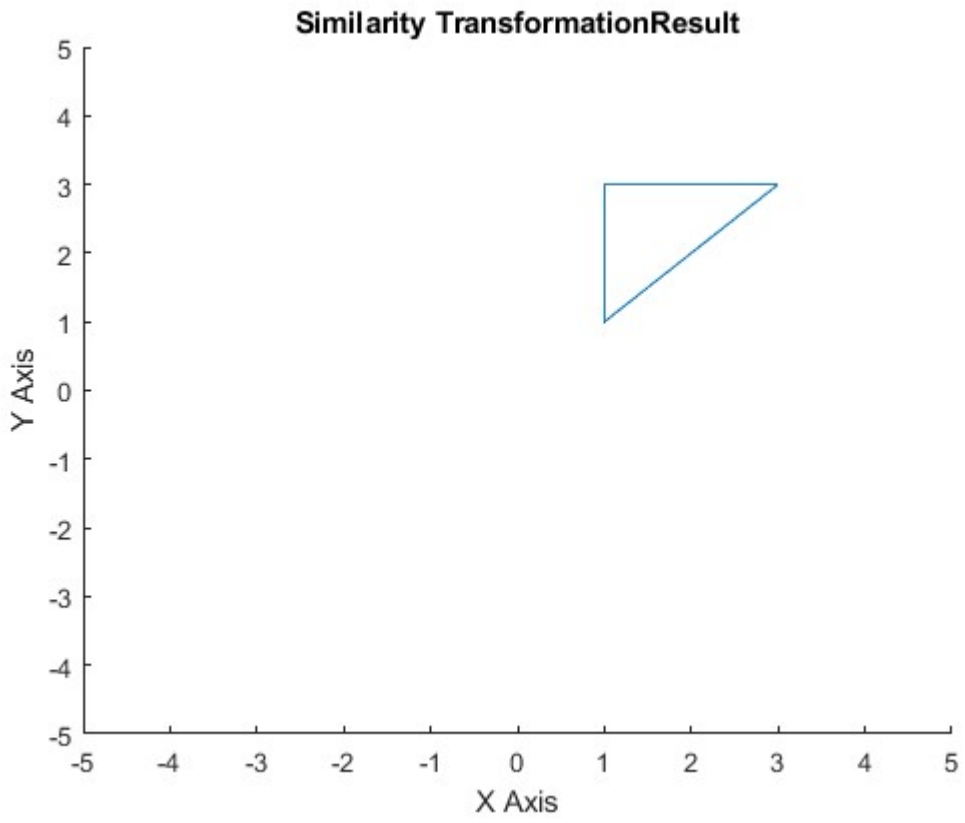
```
t =

     1     0     2
     0     1     2
     0     0     1

Points after Translation

ans =

    3.0000    4.0000    4.5000    4.0000    3.0000    2.5000
    2.0000    2.0000    3.0000    4.0000    4.0000    3.0000

Euclidian Transformation Matrix is

R =

    0.1543    0.9880    1.0000
   -0.9880    0.1543    1.0000
         0         0    1.0000

Points after Euclidian Transformation

ans =

    1.1543    1.3085    2.3737    3.2846    3.1303    2.0652
    0.0120   -0.9761   -1.3158   -0.6676    0.3205    0.6602

Similarity Transformation Matrix is

E =

     1    -1     1
     1     1     1
     0     0     1

Points after Similarity Translation

ans =

    2.0000    3.0000    2.5000    1.0000         0    0.5000
    2.0000    3.0000    4.5000    5.0000    4.0000    2.5000

Affine Transformation Matrix is

A =

     1    -1     0
    -2     0     1
     0     0     1
```

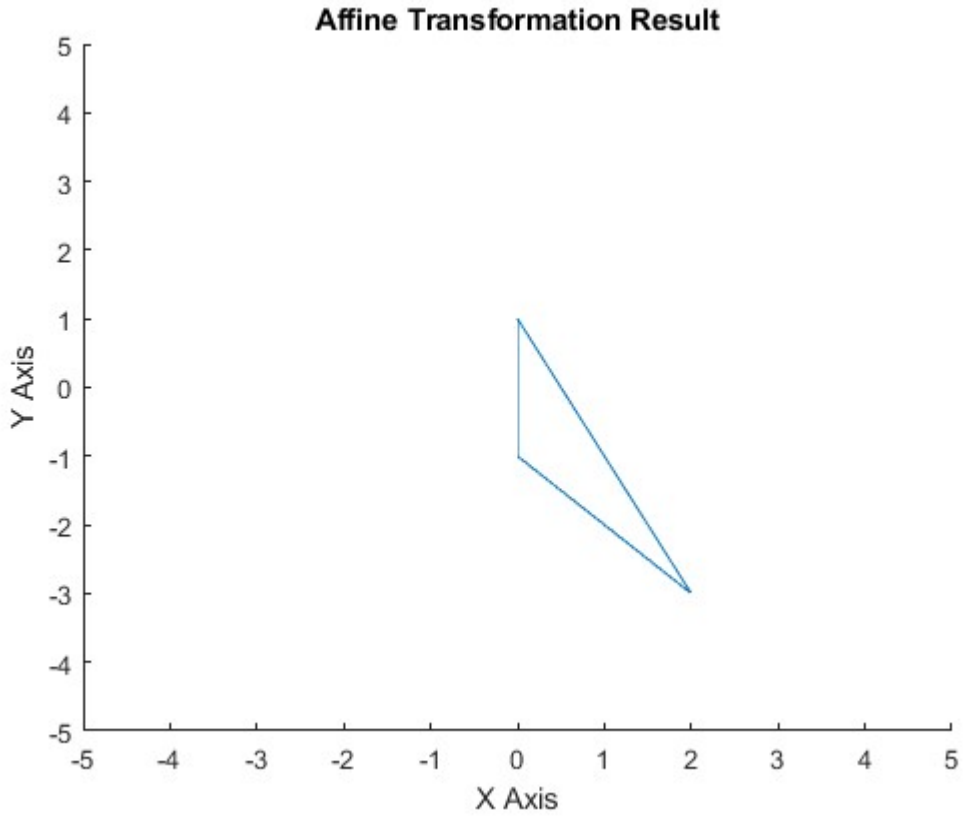
```
Points after Affine Transformation

ans =

    1.0000    2.0000    1.5000         0   -1.0000   -0.5000
   -1.0000   -3.0000   -4.0000   -3.0000   -1.0000         0

Projective Transformation Matrix is

P =

     1     2     1
     1     1     1
     2     2     1

Points after Projective Transformation

ans =

    2.0000    3.0000    5.5000    7.0000    6.0000    3.5000
    2.0000    3.0000    4.5000    5.0000    4.0000    2.5000
```

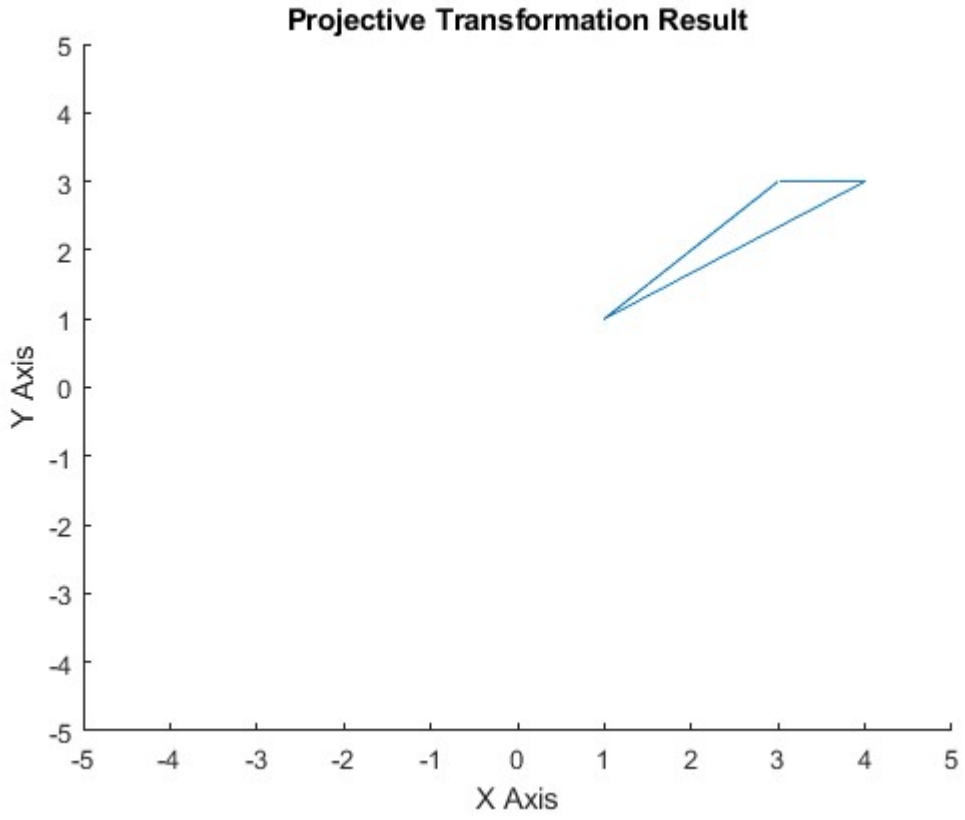


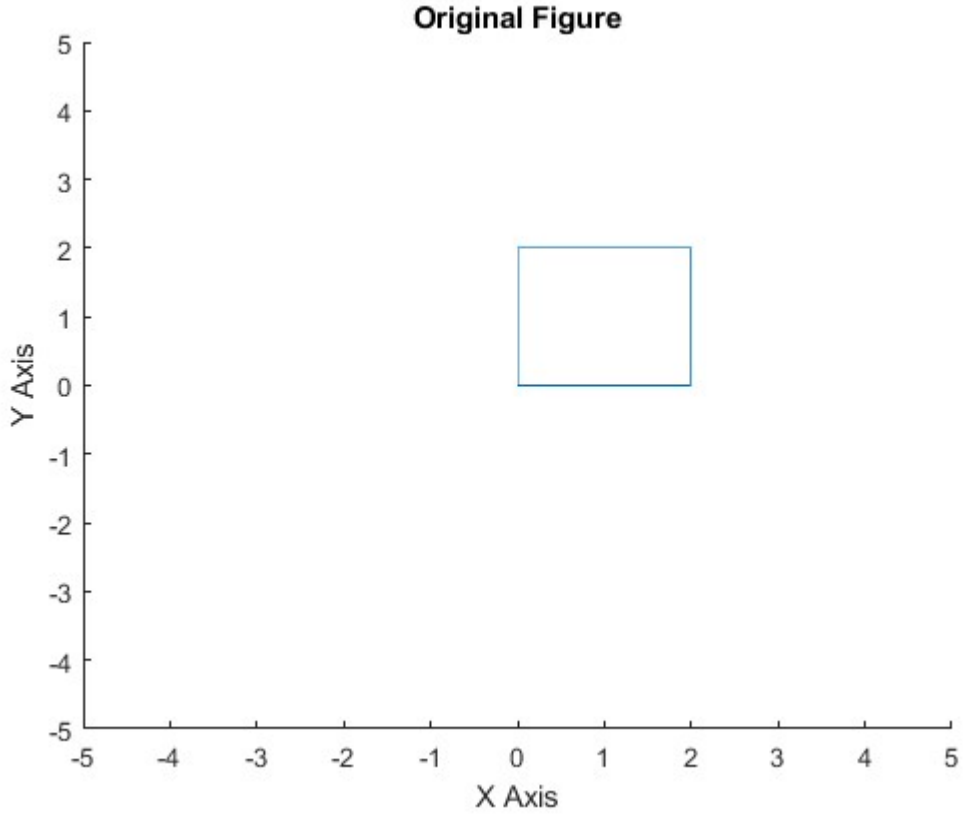

Translation Result
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

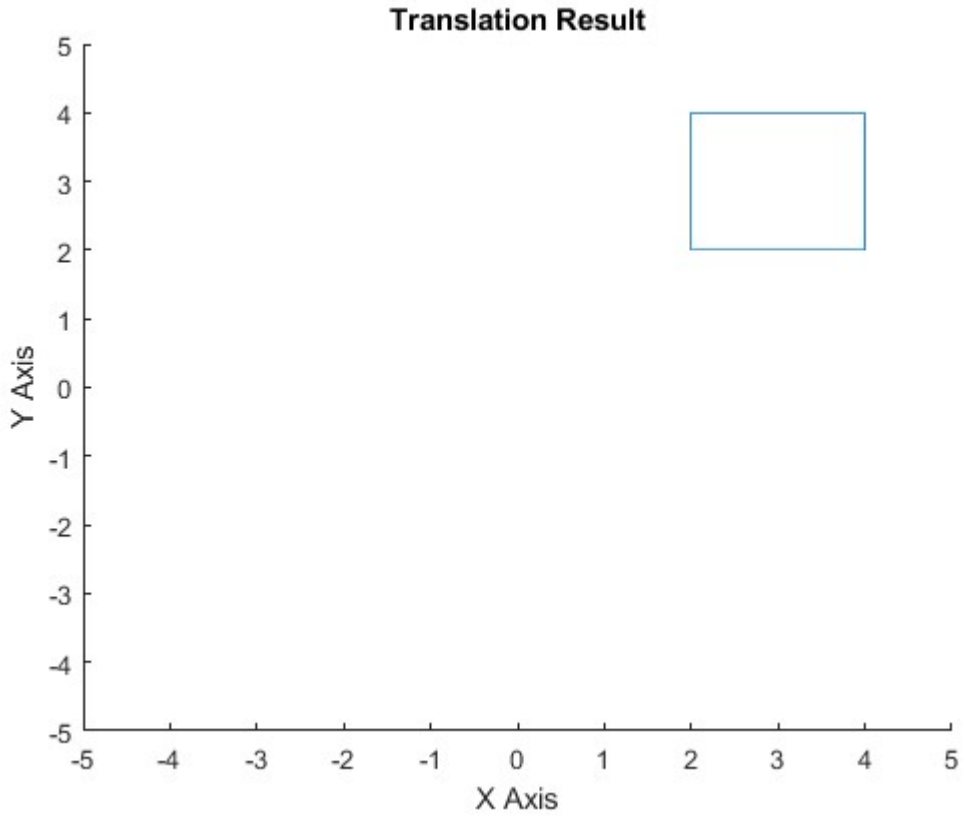

Euclidian Transformation Result
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

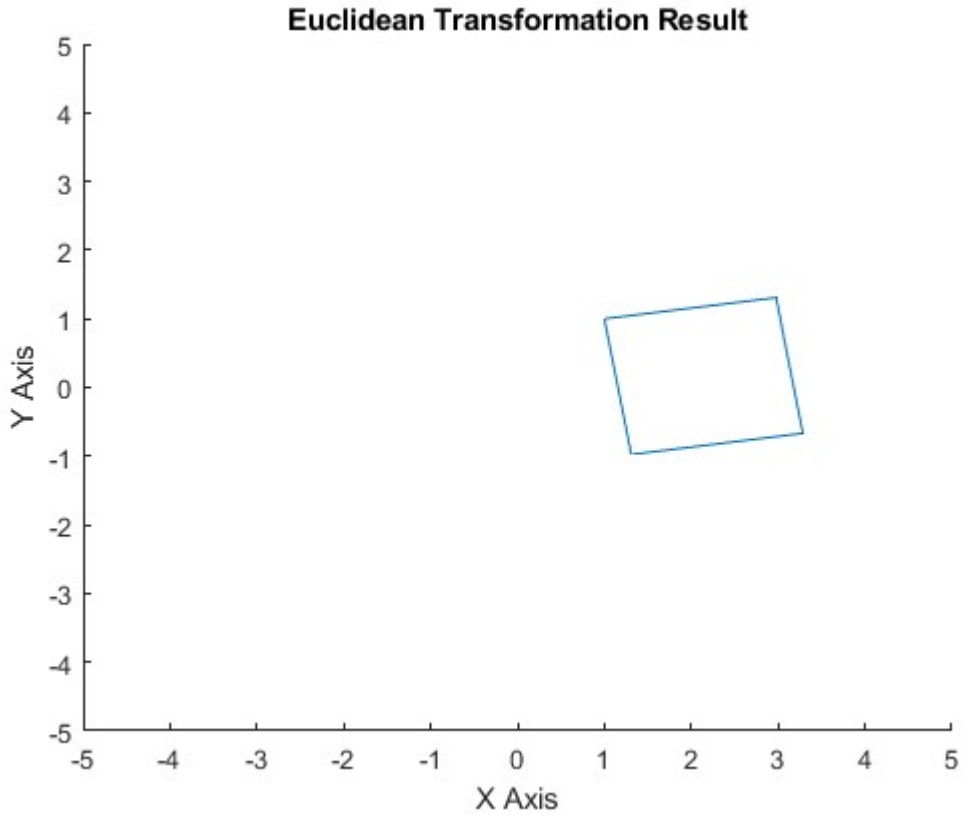

Similarity TransformationResult
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

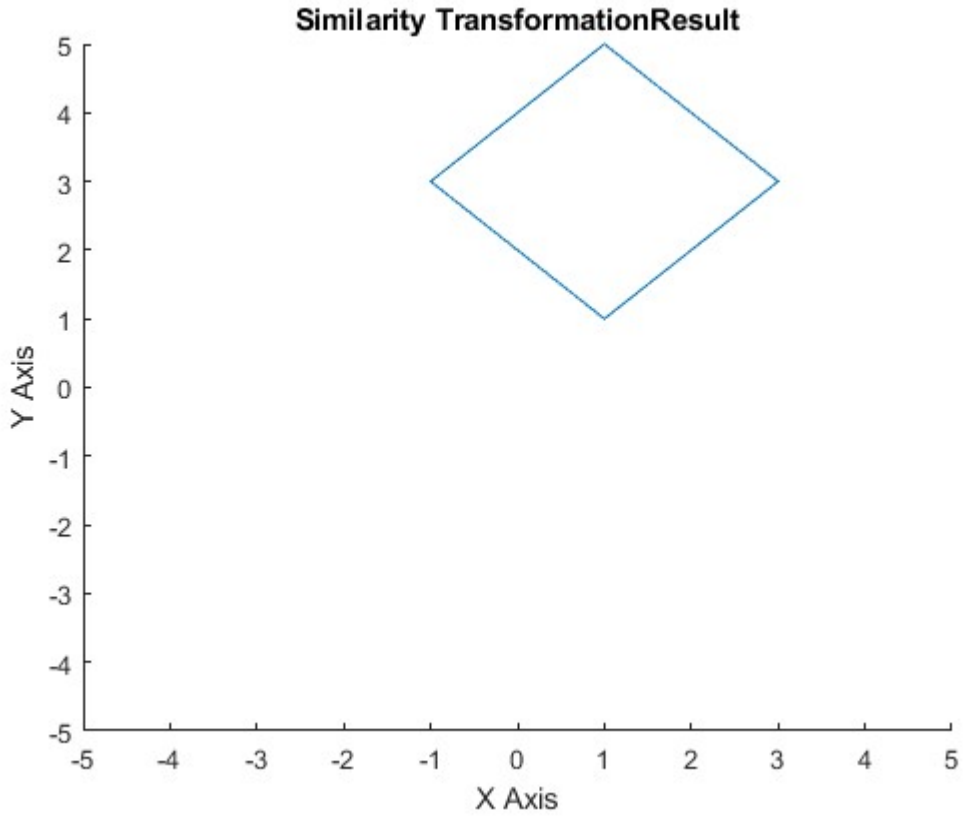

Affine Transformation Result
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

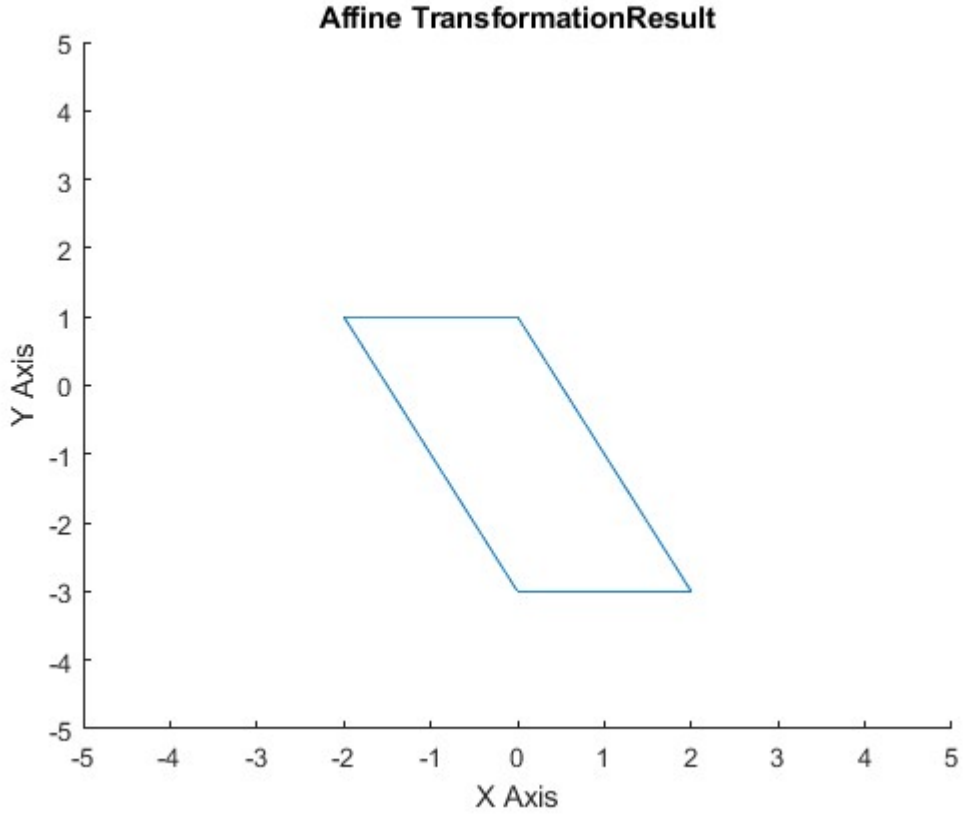

Projective Transformation Result
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

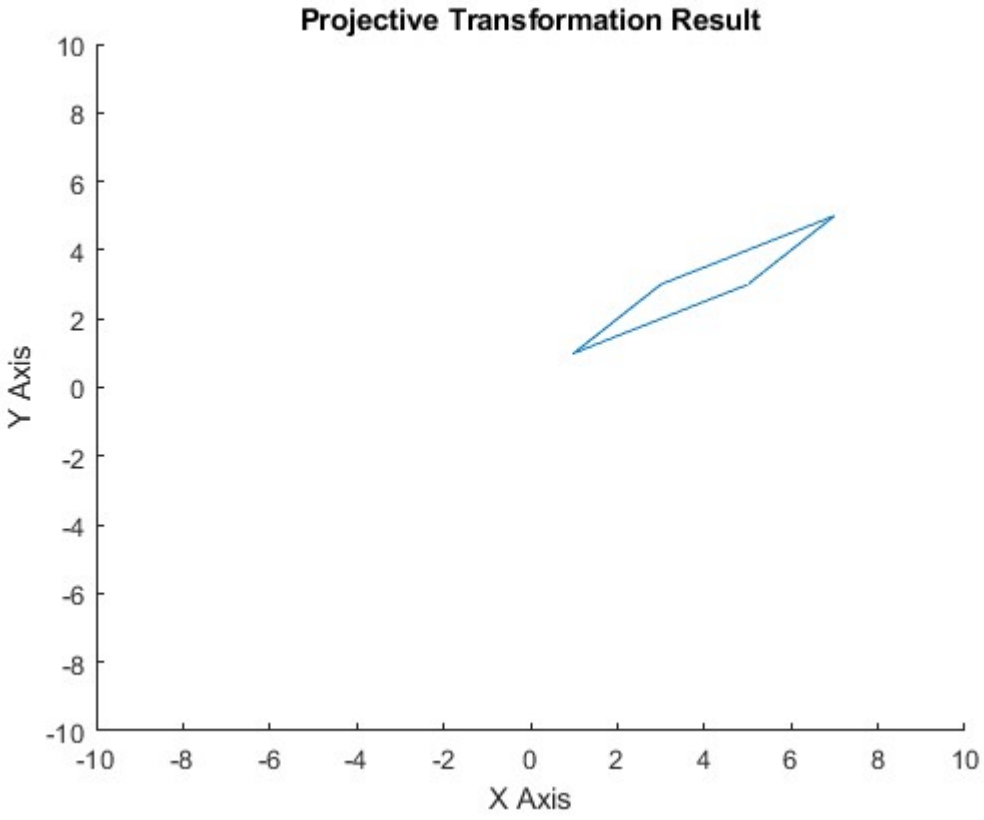

Original Figure
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

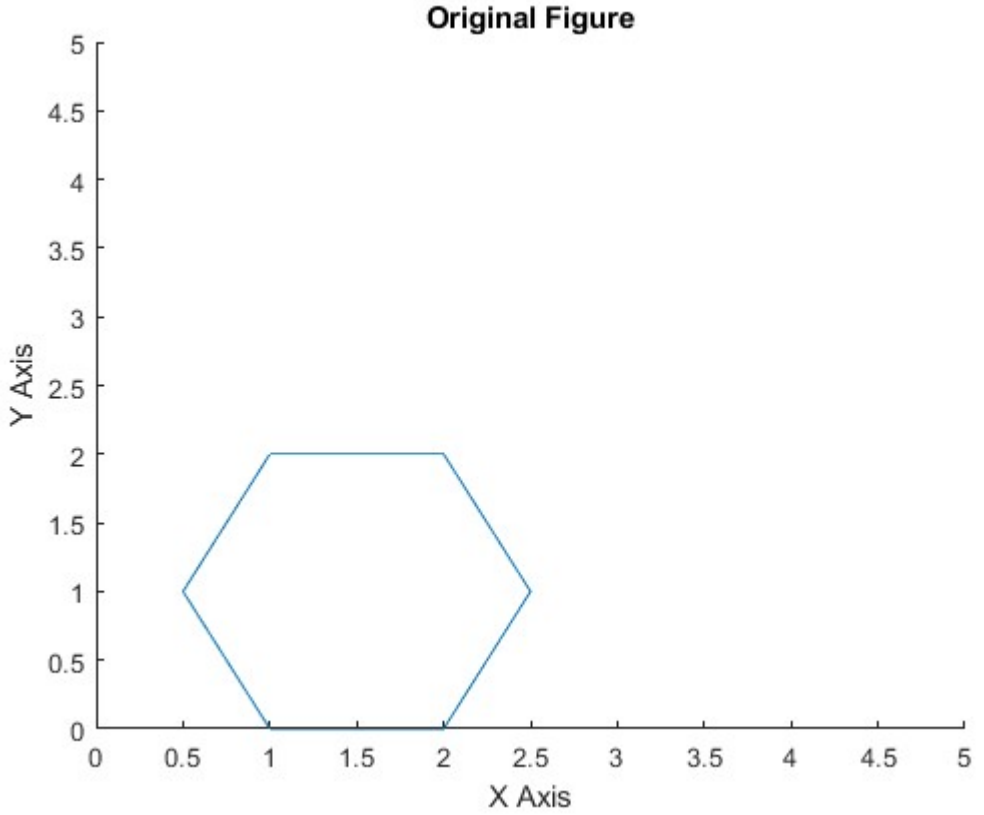

Translation Result
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

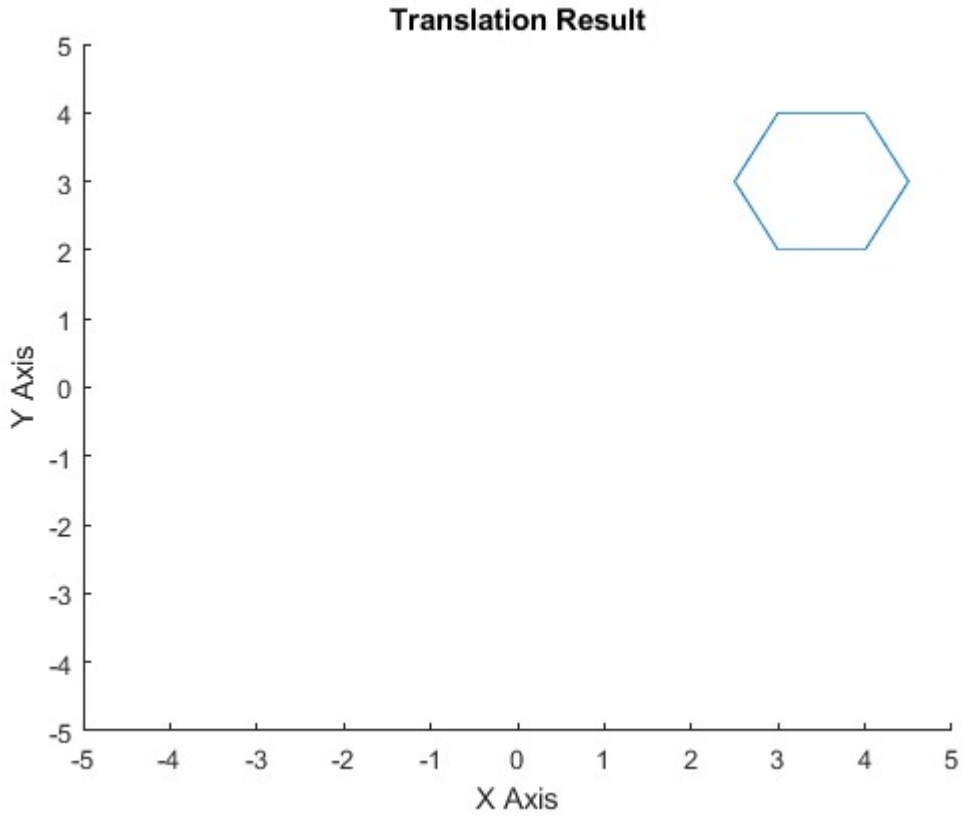

Euclidean Transformation Result
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

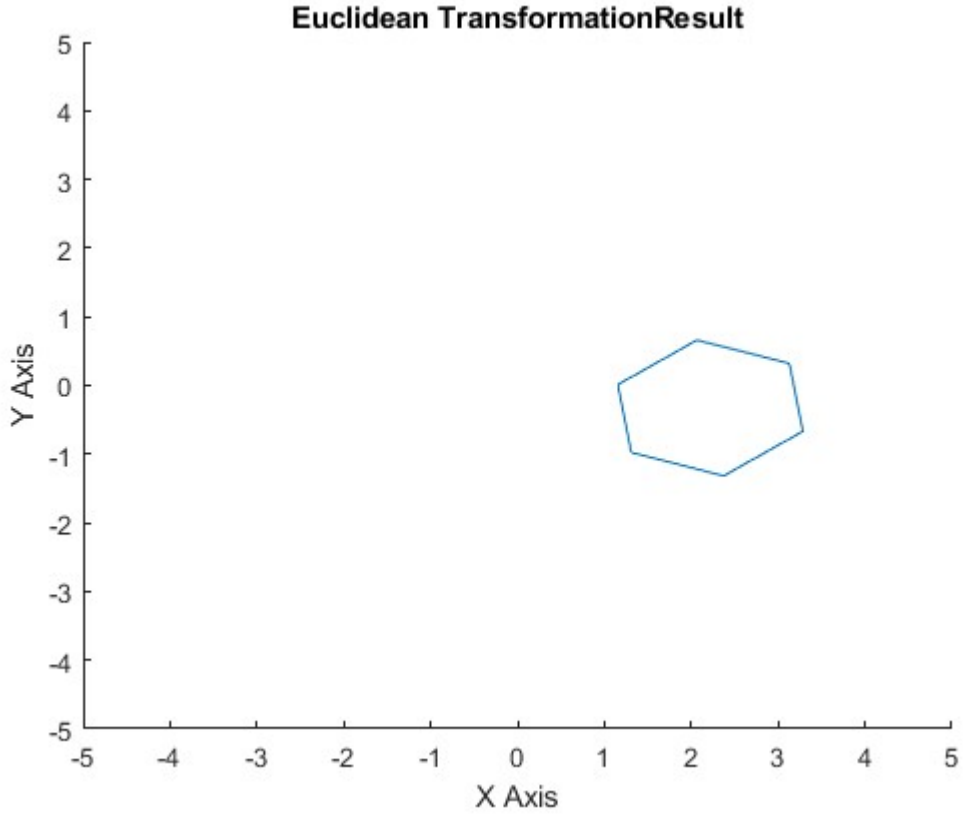

Similarity TransformationResult
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

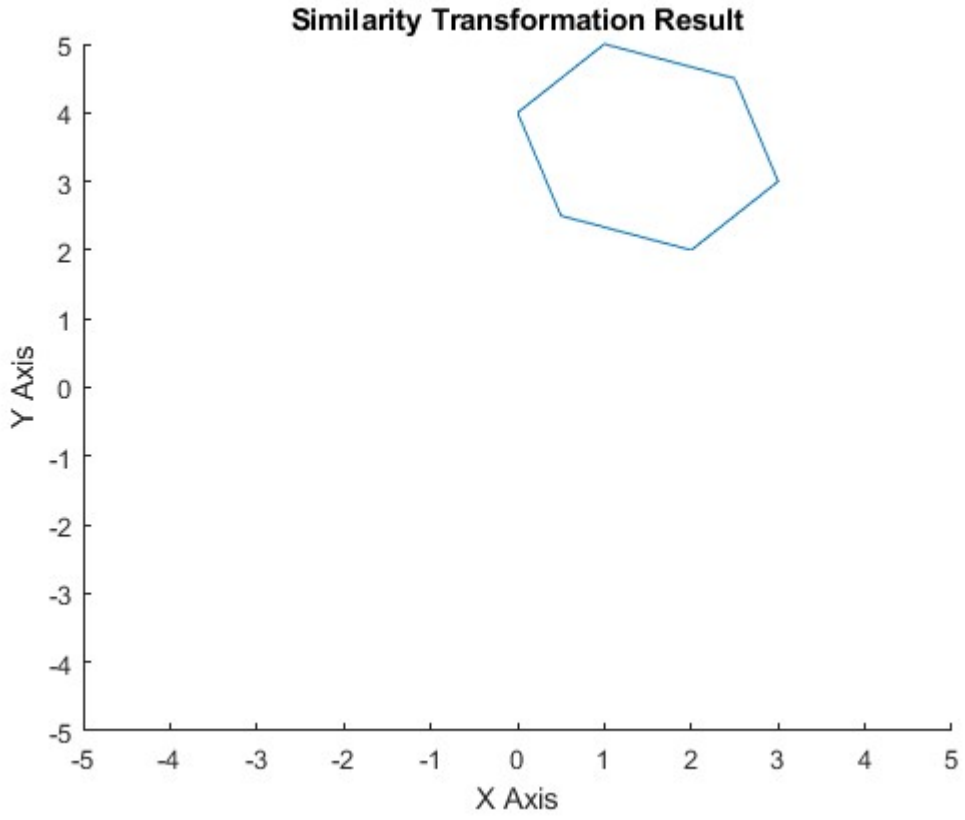

Affine TransformationResult
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

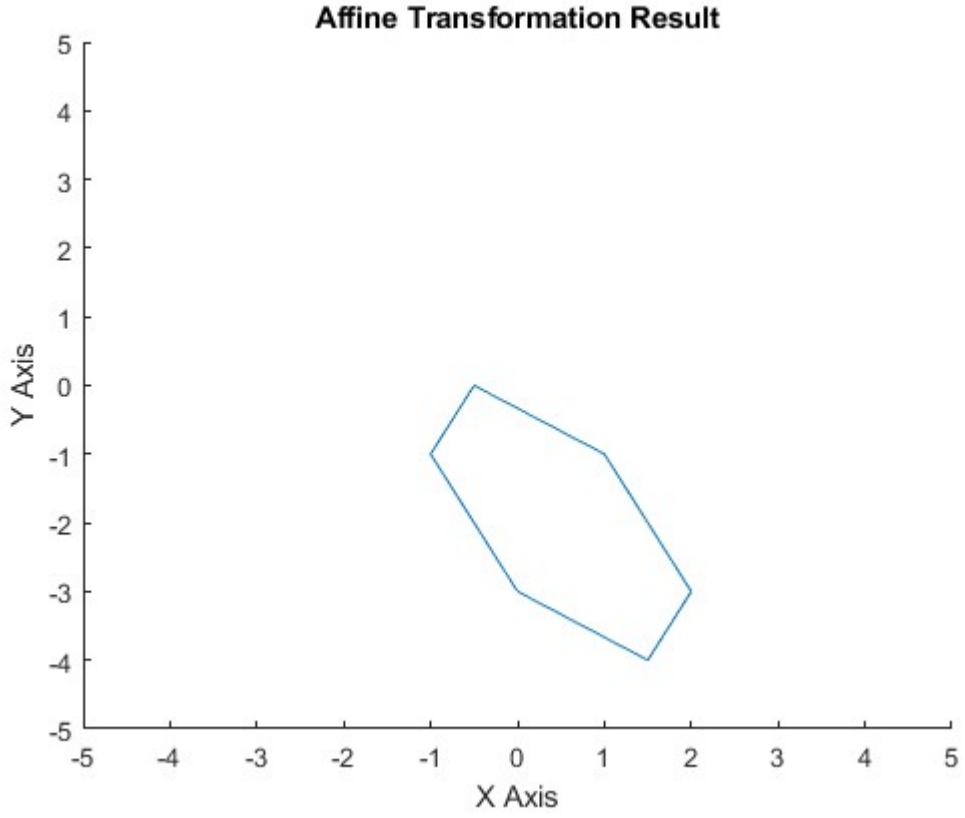

Projective Transformation Result
Y Axis
X Axis
10
8
6
4
2
0
-2
-4
-6
-8
-10
-10
-8
-6
-4
-2
0
2
4
6
8
10

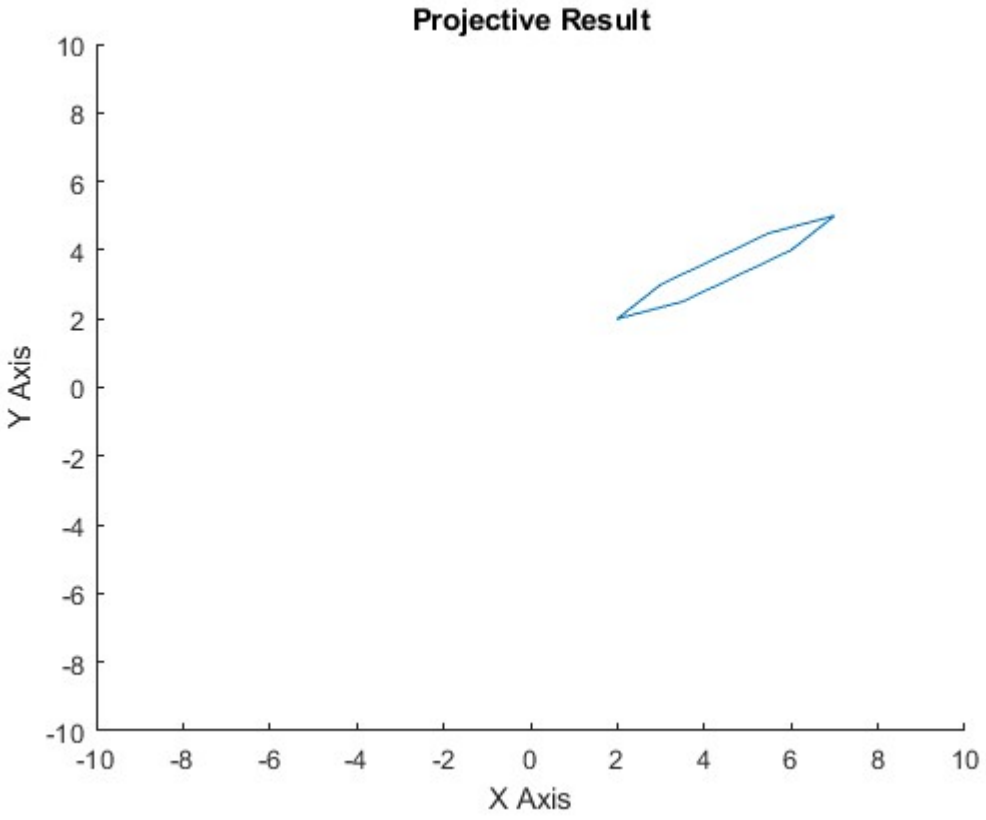

Original Figure
Y Axis
X Axis
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5


Translation Result
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5


Euclidean TransformationResult
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5


Similarity Transformation Result
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5


Affine Transformation Result
Y Axis
X Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5



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