Transformation Matrices:

transMat=[1, 0, 5; 0, 1, 6];

EuclidMat =[cos(40), -sin(40), 5; sin(40), cos(40), 6];

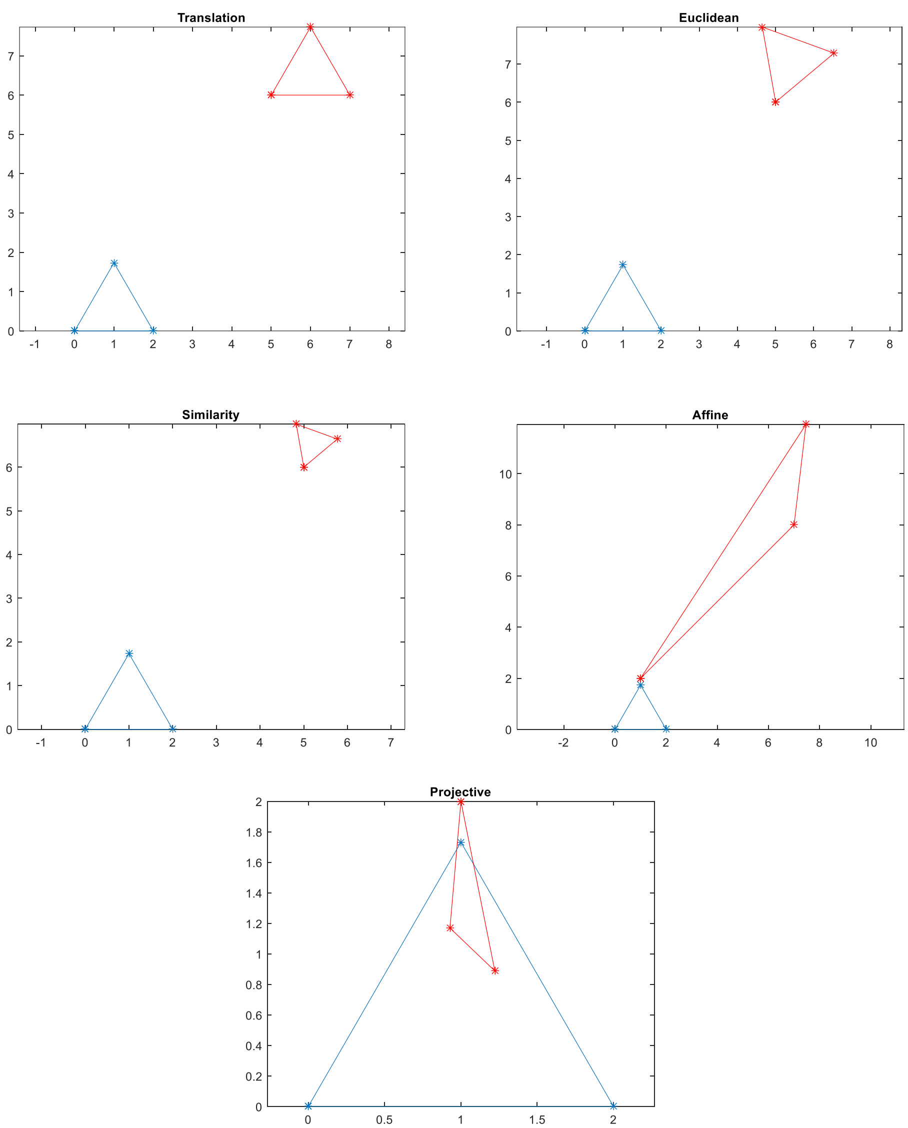
SimilMat=[0.5*cos(40), -0.5*sin(40), 5; 0.5*sin(40), 0.5*cos(40), 6];

AffineMat=[3, 2, 1; 3, 4, 2];

projMat=[5, 2, 1; 3, 4, 2; 4, 3, 1];

Equilateral Triangle:

Part 1)



Part 2)

Translation: Length of sides, angles, and orientation are preserved.

Euclidean: Length of sides, and angles are preserved.

Similarity: Angles are preserved.

Affine: Angles, length of sides and orientation changes.

Projective: Straight lines remain straight.

Part 3)

See the first section.

Part 4)

Cartesian coordinates:

Input: x = [0, 2, 1]; y = [0, 0, sqrt(3)];

Translation: x = [5, 7, 6]; y = [6.0000, 6.0000, 7.732]

Euclidean: x = [5.0000, 6.5321, 4.6527]; y = [6.0000, 7.2856, 7.9696]

Similarity: x = [5.0000, 5.7660, 4.8264]; y = [6.0000, 6.6428, 6.9848]

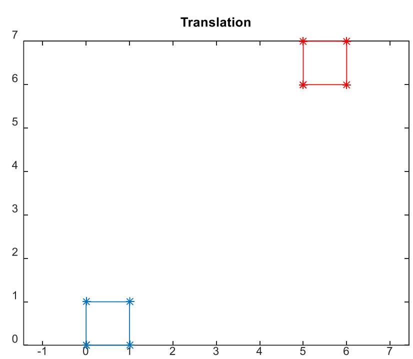
Affine: x = [1.0000, 7.0000, 7.4641]; y = [2.0000, 8.0000, 11.9282]

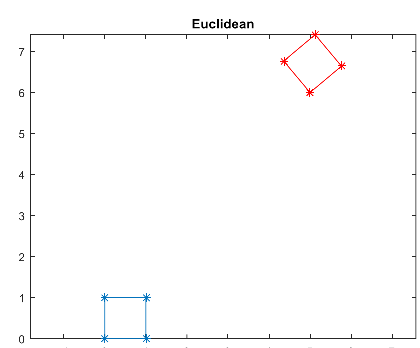
Projective: x = [1.0000, 1.2222, 0.9282]; y = [2.0000, 0.8889, 1.1699]

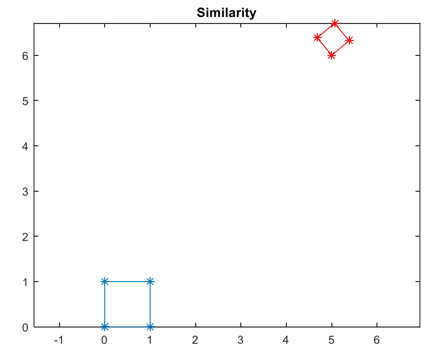
For homogeneous coordinates x's and y's are going to stay the same with z = [1, 1, 1].

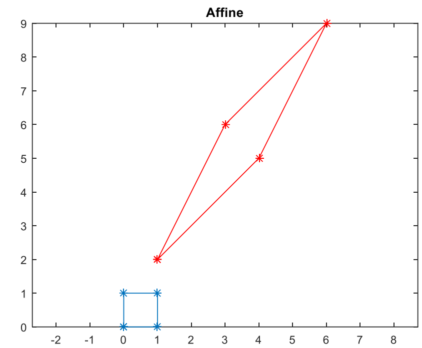
Square:

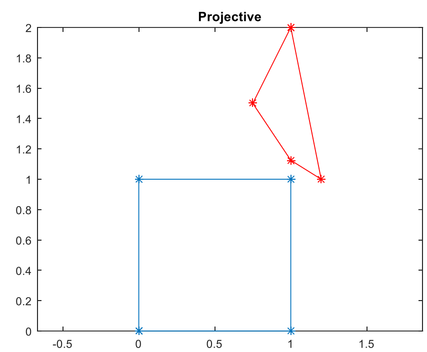
Part 1)











Part 2)

Translation: Length of sides, angles, and orientation are preserved. Parallel lines stay parallel.

Euclidean: Length of sides, angles, are preserved. Parallel lines stay parallel.

Similarity: Angles are preserved. Parallel lines stay parallel.

Affine: Angles, length of sides and orientation changes. Parallel lines stay parallel.

Projective: Straight lines remain straight.

Part 3)

See the first section.

Part 4)

Cartesian coordinates:

Input: x = [0, 1, 1, 0]; y = [0, 0, 1, 1];

Translation: x = [5, 6, 6, 5]; y = [6, 6, 7, 7];

Euclidean: x = [5.0000, 5.7660, 5.1233, 4.3572]; y = [6.0000, 6.6428, 7.4088, 6.7660];

Similarity: x = [5.0000, 5.3830, 5.0616, 4.6786]; y = [6.0000, 6.3214, 6.7044, 6.3830]

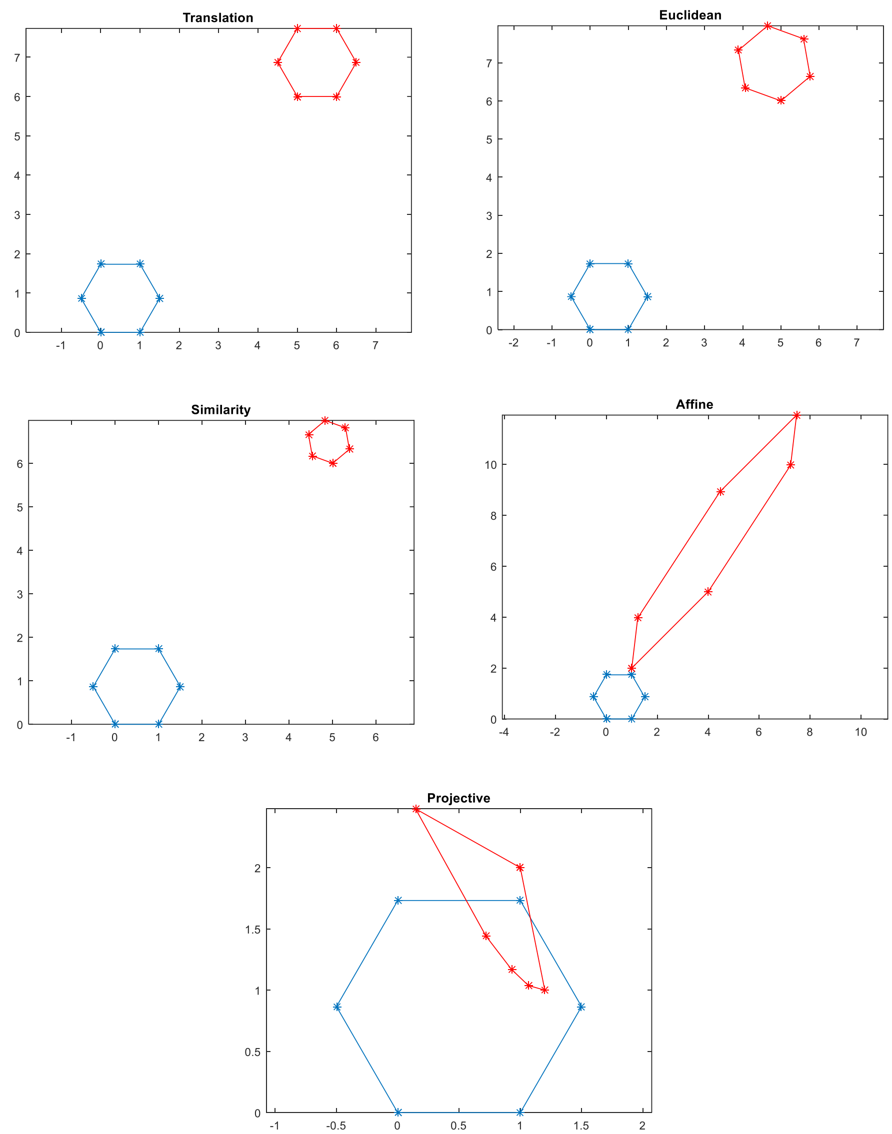
Affine: x = [1, 4, 6, 3]; y = [2, 5, 9, 6]

Projective: x = [1.0000, 1.2000, 1.0000, 0.7500]; y = [2.0000, 1.0000, 1.1250, 1.5000]

For homogeneous coordinates x’s and y’s are going to stay the same with z = [1, 1, 1, 1].

Hexagon:

Part 1)



Part 2)

Translation: Length of sides, angles, and orientation are preserved. Parallel lines stay parallel.

Euclidean: Length of sides, angles, are preserved. Parallel lines stay parallel.

Similarity: Angles are preserved. Parallel lines stay parallel.

Affine: Angles, length of sides and orientation changes. Parallel lines stay parallel.

Projective: Straight lines remain straight.

Part 3)

See the first section.

Part 4)

Cartesian coordinates:

Input: x = [0, 1, 1.5, 1, 0, -0.5]; y = [0, 0, sqrt(3)/2, sqrt(3), sqrt(3), sqrt(3)/2];

Translation: x = [5, 6, 6.5, 6, 5, 4.5]; y = [6, 6, 6.866, 7.7321, 7.7321, 6.8660]

Euclidean: x = [5, 5.766, 5.5924, 4.6527, 3.8867, 4.0603]; y = [6, 6.6428, 7.6276, 7.9696, 7.3268, 6.342]

Similarity: x = [5, 5.383, 5.2962, 4.8264, 4.4433, 4.5302]; y = [6, 6.3214, 6.8138, 6.9848, 6.6634, 6.1710]

Affine: x = [7.4641, 7.2321, 4, 1, 1.2321, 4.4641]; y = [11.9282, 9.9641, 5, 2, 3.9641, 8.9282];

Projective: x = [0.1452, 1, 1.2, 1.0661, 0.9282, .7205]; y = [2.4805, 2, 1, 1.0381, 1.1699, 1.4409];

For homogeneous coordinates x’s and y’s are going to stay the same with z = [1, 1, 1, 1, 1, 1].