Proof:

Given points a and b as elements of G1 and G2 and and as elements of G2, there exists an affine transform about the midpoint of a line drawn between some a- and some b-. If this exists for all points a,b and , then there exists an isomorphism between Graph G1 and Graph G2.

Proof by induction:

Base Case:

Given two vertices, a and b, a being an element of G1 and b an element of G2, show that there is an isomorphism.

1. For every two points there is a straight line. Draw a line between a and b.
2. Every line has a midpoint, draw a midpoint on the straight line.
3. Divide the line by its midpoint, the line segment to the left being u and the line segment to the right v.
4. Rotating the line segment on the left, u, 180 degrees around the midpoint will make it coincide with the line segment on the right, v.
5. Line segment v is drawn between the midpoint and b such that a now coincides with b.
6. Since we have only two points the graph G1 and G2 are isomorphic.

Inductive Case:

Given n vertices, a,b are elements of the edge g of G1 and c,d are elements of the edge h of G2, show that there is an isomorphism between all n vertices of both graphs.

1. By the base case, we know that given two points, if there is rotation about the midpoint matching the two points that there is an isomorphism.
2. For all g and h of n, perform the rotation mapping process for each vertex of g in G1 on to each vertex of h in G2.
3. If all vertices of edges have a match, then the proof is complete and the graph is isomorphic.

Complexity Analysis:

For each vertex in an edge the rotation operation must be performed, along with the midpoint calculation. Because we must test all possible edges, this makes at least 2 tests per vertex calculation. There are n vertices in each graph (assuming they are isomorphic) so the complexity is T(|2V2|) or O(n2).