1a:

transform

[[-0.45827554 0.29474236 0.01395749 -0.00402579]

[ 0.05085589 0.05458471 0.54105993 0.05237592]

[-0.10900958 -0.1783455 0.04426783 -0.5968205 ]]

<u, v> first

[[ 1.04675226]

[-0.36260293]]

<u, v> last

[[ 0.14190605]

[-0.451843 ]]

residual first point

[0.00264821]

residual last point

[0.4065751]