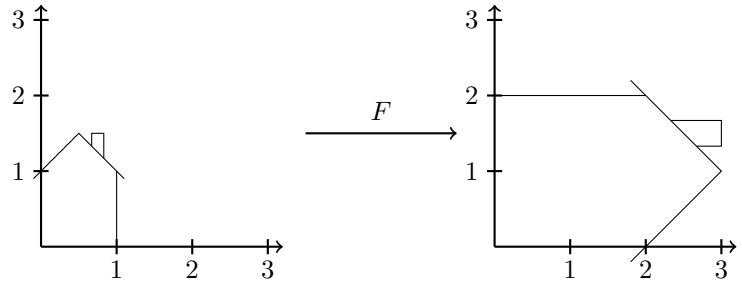
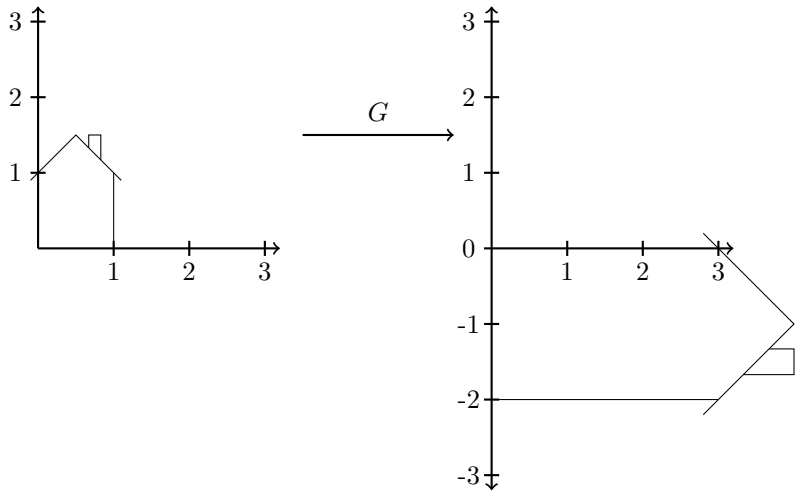
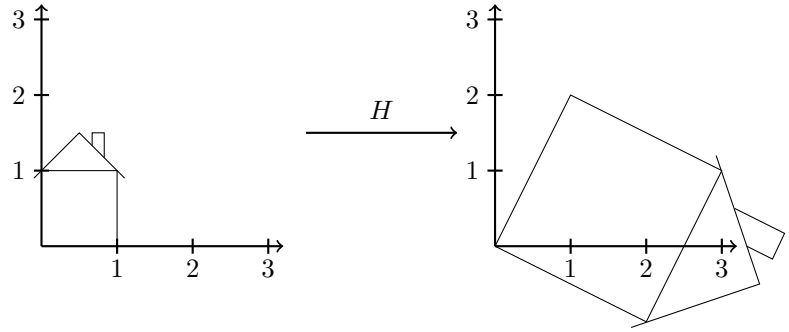
MTH 309 - Activity 4
Linear Transformations

1. For each of the following, describe in words what the effect of the linear transformation is.







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2. For each of the above, where does the transformation send each of the following?

   i. $(1, 0)$
   ii. $(0, 1)$
   iii. $(2, 3)$
   iv. $(-5, 7)$
   v. (x, y)

3. Describe algebraically (with an equation) what the above transformations do to an input vector.

4. Which of the following are linear transformations?

   (a) $R(x, y, z) = (3x - 2y, x + y + z, y - z, x)$

   (b) $S(x, y, z) = (x - 1, y + 2, z - 6)$

   (c) $T(x, y, z) = xyz$

   (d) $U(x, y, z) = (x, x, x, y, y, y, z, z, z)$

5. For the functions in problem 4 above that are linear transformations, describe geometrically how to obtain the output vector from the input vector.

6. Find the matrix representation for all the linear transformations in this activity.

7. Of the linear transformations in this activity, which are 1-1, and which are onto?