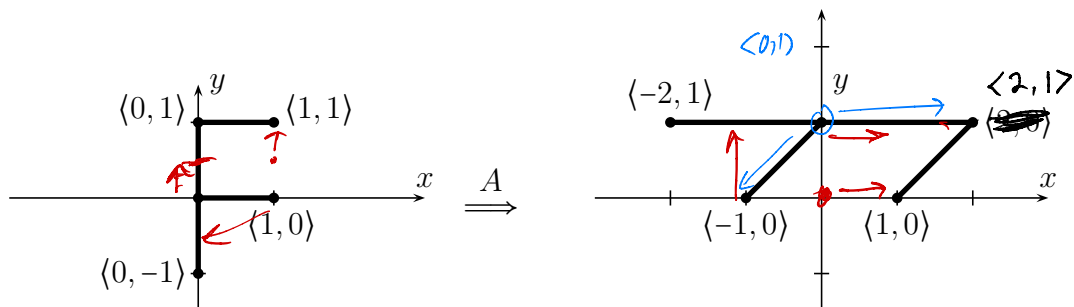


Name: **Answer Key**

PID:

These problems concern the affine function A which maps the "F" shape as shown:



1. Express transformation $A: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ in the form $A(\mathbf{x}) = M\mathbf{x} + \mathbf{u}$ where M is a matrix and $\mathbf{u} \in \mathbb{R}^2$. (Given M and \mathbf{u} explicitly.)

$$A(\vec{x}) = \begin{pmatrix} -1 & 2 \\ -1 & 0 \end{pmatrix} \vec{x} + \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$M = \begin{pmatrix} -1 & 1 \\ -1 & 0 \end{pmatrix} \quad \mathbf{u} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

2. Now express the inverse transformation A^{-1} in the form $A^{-1}(\mathbf{x}) = N\mathbf{x} + \mathbf{v}$ where N is a matrix and $\mathbf{v} \in \mathbb{R}^2$.

$$A^{-1}(\vec{x}) = \begin{pmatrix} 0 & -1 \\ 1 & -\frac{1}{2} \end{pmatrix} \vec{x} + \begin{pmatrix} 1 \\ \frac{1}{2} \end{pmatrix}.$$

$$N = \begin{pmatrix} 0 & -1 \\ \frac{1}{2} & -\frac{1}{2} \end{pmatrix} \quad \vec{v} = \begin{pmatrix} 1 \\ \frac{1}{2} \end{pmatrix}.$$