Linearity Primer
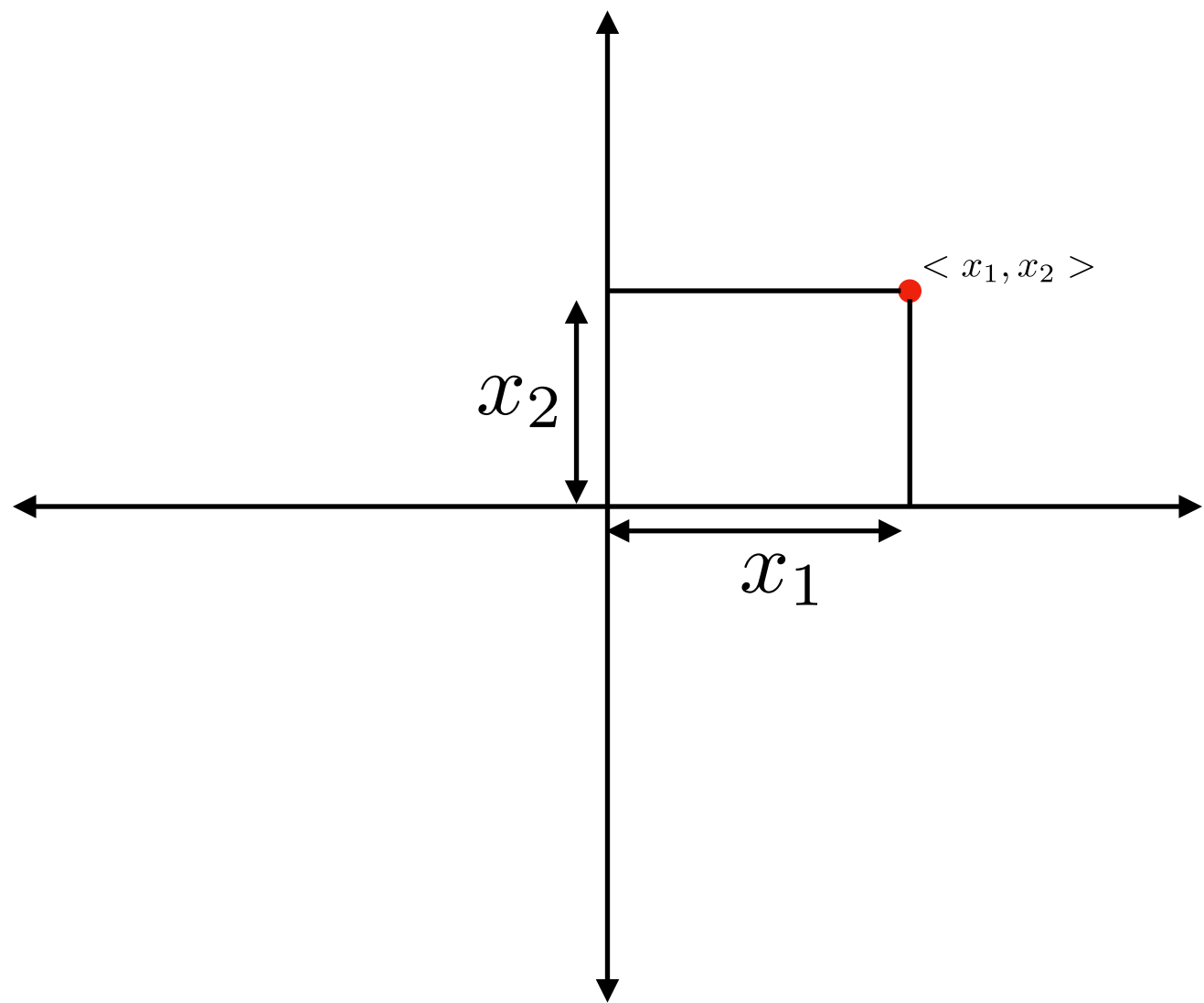
$$< x_1, x_2 >$$

Linear Functions

$$w_1 \cdot x_1 + w_2 \cdot x_2$$
$$=$$
$$\vec{w} \cdot \vec{x}$$
$$\vec{w} = < w_1, w_2 >$$
$$\vec{x} = < x_1, x_2 >$$

Linear Transformations

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} a \cdot x_1 + b \cdot x_2 \\ c \cdot x_1 + d \cdot x_2 \end{bmatrix}$$

$$(2, 2) \ \cdot \ (2, 1) \ \rightarrow \ (2, 1)$$

$$(10, 2) \ \cdot \ (2, 1) \ \rightarrow \ (10, 1)$$

$$(m, n) \ \cdot \ (n, p) \ \rightarrow \ (m, p)$$

- Linear Functions - linear combinations of coordinates

- Linear Transformations - new coordinates using linear combinations of old ones

- Linear Transformations allow shape change