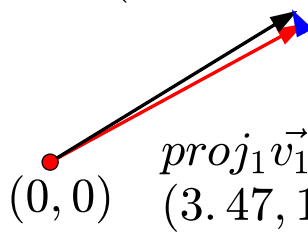


first and second principal components of  $\vec{v}_1$

$$\vec{v}_1 = (3.38, 2.07)$$

$$\|\vec{v}_1\|^2 = \|\text{proj}_1 \vec{v}_1\|^2 + \|\text{proj}_2 \vec{v}_1\|^2 = 3.47^2 + 1.89^2 + (-0.10)^2 + 0.18^2$$


$\text{proj}_1 \vec{v}_1 = (3.47, 1.89)$

$\text{proj}_2 \vec{v}_1 = (-0.10, 0.18)$