Proof of Commutative & Distributive Properties Let $\vec{u} = \langle x_1, y_1 \rangle$ and $\vec{v} = \langle x_2, y_2 \rangle$ Commutative Property Apply the commutative property for \mathbb{R}

$$\vec{u} + \vec{v} =$$

$$\vec{u} + \vec{v} = \langle x_1 + x_2, y_1 + y_2 \rangle = \langle x_2 + x_1, y_2 + y_1 \rangle = \vec{v} + \vec{u}$$

Distributive Property
Apply the distributive property for
$$\mathbb{R}$$

$$y = \langle x_1 + x_2, y_1 \rangle$$

 $r(\vec{u}+\vec{v})=r\cdot\langle x_1+x_2,y_1+y_2\rangle$

 $= r\vec{u} + r\vec{v}$

 $= \langle r(x_1 + x_2), r(y_1 + y_2) \rangle$ $= \langle rx_1 + rx_2, ry_1 + ry_2 \rangle$ $=\langle rx_1, ry_1\rangle + \langle rx_2, ry_2\rangle$