R^2

15) $p = |p|(\cos\phi, \sin\phi)$

$\mathbf{p} = (p_1, p_2)$

$|p| = \sqrt{p_1^2 + p_2^2}$

$$p_1 = |p| \cdot \cos\phi \qquad p_2 = |p| \cdot \sin\phi$$

$$\mathbf{p} = (p_1, p_2) = (|p| \cdot \cos\phi, |p| \cdot \sin\phi) = |p| \cdot (\cos\phi, \sin\phi)$$

$$u_p = \frac{p}{|p|} \qquad p = |p| \cdot (\cos\phi, \sin\phi)$$

$$u_p = \frac{|p| \cdot (\cos\phi, \sin\phi)}{|p|}$$

$$u_p = (\cos\phi, \sin\phi)$$

$\sin^2\phi + \cos^2\phi = 1$

$$p_1 = |p| \cdot \cos\phi \qquad p_2 = |p| \cdot \sin\phi$$

$$\cos\phi = \frac{p_1}{|p|} \qquad \sin\phi = \frac{p_2}{|p|}$$

$$\frac{p_1^2 + p_2^2}{|p|^2} = 1 \rightarrow \frac{p_1^2 + p_2^2}{\left(\sqrt{p_1^2 + p_2^2}\right)^2} = 1$$