

6.3.1

$$u = (1, -1, 0)$$

$$v = (1, 2, 0)$$

$$|u| = \sqrt{1+1} = \sqrt{2}$$

$$|v| = \sqrt{1+4} = \sqrt{5}$$

$$u \times v = \begin{pmatrix} 1 & -1 & 0 \\ 1 & 2 & 0 \end{pmatrix}$$

$$(-1 \cdot 0 - 0 \cdot 2), (0 \cdot 1 - 0 \cdot 1), (1 \cdot 2 - (-1) \cdot 1)$$

$$u \times v = (0, 0, 3)$$

$$|u \times v| = \sqrt{0+0+9} = \sqrt{9} = 3$$

$$u \times v = |u| \cdot |v| \cos \theta \leftarrow \text{Parallelogram Area}$$

$$= 1 \cdot 1 + (-1) \cdot 2 + 0 \cdot 0$$

$$= 1 - 2 + 0$$

$$\sqrt{2} \sqrt{5} = -1 \cos \theta$$

$$\sqrt{10} = -\cos \theta$$

$$\cos \theta = \frac{-1}{\sqrt{10}}$$

$$\sin \theta = \sqrt{1 - \cos^2 \theta}$$

$$\sin \theta = \sqrt{1 - \left(\frac{-1}{\sqrt{10}}\right)^2}$$

$$\sin \theta = \frac{3}{\sqrt{10}}$$