

$$1) \quad \mathbf{u} = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix} \quad \mathbf{v} = \begin{pmatrix} 1 \\ 2 \\ 0 \end{pmatrix}$$

$$|\mathbf{u}| = \sqrt{(1)^2 + (-1)^2 + 0^2} \quad |\mathbf{v}| = \sqrt{(1)^2 + (2)^2 + (0)^2}$$

$$|\mathbf{u}| = \sqrt{2} \quad |\mathbf{v}| = \sqrt{5}$$

$$\mathbf{u} \times \mathbf{v} = \begin{pmatrix} (-1)(0) - (0)(2) \\ (0)(1) - (1)(0) \\ (1)(2) - (-1)(1) \end{pmatrix}$$

$$\mathbf{u} \times \mathbf{v} = (0, 0, 3)$$

$$|\mathbf{u} \times \mathbf{v}| = \sqrt{0^2 + 0^2 + 3^2} = 3$$

$$\mathbf{u} \times \mathbf{v} = |\mathbf{u}| \cdot |\mathbf{v}| \cdot \cos \theta$$

$$\mathbf{u} \times \mathbf{v} = (1) \cdot (1) + (-1) \cdot (2) + (0) \cdot (0)$$

$$\mathbf{u} \times \mathbf{v} = -1$$

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

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

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

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

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

$$\mathbf{u} \times \mathbf{v} = \begin{pmatrix} \mathbf{u}_2 \mathbf{v}_3 - \mathbf{u}_3 \mathbf{v}_2 \\ \mathbf{u}_3 \mathbf{v}_1 - \mathbf{u}_1 \mathbf{v}_3 \\ \mathbf{u}_1 \mathbf{v}_2 - \mathbf{u}_2 \mathbf{v}_1 \end{pmatrix}$$

$$\mathbf{u} \times \mathbf{v} = |\mathbf{u}| \cdot |\mathbf{v}| \cdot \cos \theta$$

$$|\mathbf{u} \times \mathbf{v}| =$$
~~$$|\mathbf{u}| \cdot |\mathbf{v}| \cdot \sin \theta$$~~

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

$$|\mathbf{u} \times \mathbf{v}| =$$
~~$$|\mathbf{u}| \cdot |\mathbf{v}| \cdot \sin \theta$$~~

$$|\mathbf{u} \times \mathbf{v}| =$$
~~$$\sqrt{2} \cdot \sqrt{5} \cdot \sin \theta$$~~

$$|\mathbf{u} \times \mathbf{v}| = \sqrt{2} \cdot \sqrt{5} \cdot \frac{3}{\sqrt{10}}$$

$$|\mathbf{u} \times \mathbf{v}| = 3$$