

Quiz 1

1. Find the center and radius of the sphere:

$$x^2 + y^2 + z^2 + 2x - 2y + 4z = 10.$$

$$(x^2 + 2x + 1) + (y^2 - 2y + 1) + (z^2 + 4z + 4) = 10 + 1 + 1 + 4$$

$$(x+1)^2 + (y-1)^2 + (z+2)^2 = 16$$

Center:  $(-1, 1, -2)$

Radius: 4

2. Suppose that  $\|\mathbf{u}\| = 3$  and  $\|\mathbf{v}\| = 2$ . Find  $\mathbf{u} \cdot \mathbf{v}$ , given that the angle between the two vectors is  $\frac{\pi}{4}$ .

$$\begin{aligned}\vec{u} \cdot \vec{v} &= \cos(\theta) \|\vec{u}\| \|\vec{v}\| \\ &= \cos(\pi/4) \cdot 3 \cdot 2 \\ &= \frac{\sqrt{2}}{2} \cdot 6 = \boxed{3\sqrt{2}}\end{aligned}$$

3. Given the vectors:

$$\mathbf{u} = \langle 2, 1, -1 \rangle,$$

$$\mathbf{v} = \langle -3, 4, 1 \rangle$$

find  $\mathbf{u} \times \mathbf{v}$  and  $\mathbf{v} \times \mathbf{u}$ .

$$\vec{u} \times \vec{v} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 2 & 1 & -1 \\ -3 & 4 & 1 \end{vmatrix} = \boxed{\langle 5, 1, 11 \rangle}$$

$$\Rightarrow \vec{v} \times \vec{u} = \langle -5, -1, -11 \rangle$$