1. Find an equation of the sphere with center \((1, -4, 3)\) and radius 5. What is the intersection of this sphere with the \(xz\)-plane?

Eqn: \((x-1)^2 + (y+4)^2 + (z-3)^2 = 25\)

On the \(xz\) plane, \(y = 0 \Rightarrow (x-1)^2 + 16 + (z-3)^2 = 25 \Rightarrow (x-1)^2 + (z-3)^2 = 9\)

2. Find \(|\mathbf{a}|\), \(\mathbf{a} + \mathbf{b}\), \(\mathbf{a} - \mathbf{b}\), \(2\mathbf{a}\), \(3\mathbf{a} + 4\mathbf{b}\)

\(\mathbf{a} = \mathbf{i} - 2\mathbf{j} + \mathbf{k} \quad \mathbf{b} = \mathbf{j} + 2\mathbf{k}\)

\(|\mathbf{a}| = \sqrt{1 + 4 + 1} = \sqrt{6}\)

\(\mathbf{a} + \mathbf{b} = \mathbf{i} - \mathbf{j} + 3\mathbf{k}\)

\(\mathbf{a} - \mathbf{b} = \mathbf{i} - 3\mathbf{j} - \mathbf{k}\)

\(2\mathbf{a} = 2\mathbf{i} - 4\mathbf{j} + 2\mathbf{k}\)

\(3\mathbf{a} + 4\mathbf{b} = 3\mathbf{i} - 2\mathbf{j} + 11\mathbf{k}\)