

31. Since $ab \cos \phi = a_x b_x + a_y b_y + a_z b_z$,

$$\cos \phi = \frac{a_x b_x + a_y b_y + a_z b_z}{ab} .$$

The magnitudes of the vectors given in the problem are

$$\begin{aligned} a = |\vec{a}| &= \sqrt{(3.0)^2 + (3.0)^2 + (3.0)^2} = 5.2 \\ b = |\vec{b}| &= \sqrt{(2.0)^2 + (1.0)^2 + (3.0)^2} = 3.7 . \end{aligned}$$

The angle between them is found from

$$\cos \phi = \frac{(3.0)(2.0) + (3.0)(1.0) + (3.0)(3.0)}{(5.2)(3.7)} = 0.926 .$$

The angle is $\phi = 22^\circ$.