Answer on Question #50734 –Math – Analytic Geometry

Find the direction cosines of the perpendicular from the origin to the plane

$$\vec{r}(6\vec{i} + 4\vec{j} + 2\sqrt{3}\vec{k}) + 2 = 0$$

Solution

Equation of the plane is

$$\vec{r}\left(6\vec{i} + 4\vec{j} + 2\sqrt{3}\vec{k}\right) = -2 \; or \; \vec{r}\left(-3\vec{i} - 2\vec{j} - \sqrt{3}\vec{k}\right) = 1$$

which is of the form $\vec{r} \cdot \vec{n} = d$. A normal vector to the plane is

$$\vec{n} = -3\vec{i} - 2\vec{j} - \sqrt{3}\vec{k}.$$

A unit normal vector to the plane is

$$\frac{\vec{n}}{|\vec{n}|} = \frac{-3\vec{i} - 2\vec{j} - \sqrt{3}\vec{k}}{\sqrt{(-3)^2 + (-2)^2 + \left(-\sqrt{3}\right)^2}} = -\frac{3}{4}\vec{i} - \frac{2}{4}\vec{j} - \frac{\sqrt{3}}{4}\vec{k} = -\frac{3}{4}\vec{i} - \frac{1}{2}\vec{j} - \frac{\sqrt{3}}{4}\vec{k}.$$

The direction cosines of $\vec{n}$ are $-\frac{3}{4}, -\frac{1}{2}, -\frac{\sqrt{3}}{4}$.