

3.11 Find a unit vector parallel to either direction of the line described by

$$2x + z = 4.$$

Solution: First, we find any two points on the given line. Since the line equation is not a function of y , the given line is in a plane parallel to the x - z plane. For convenience, we choose the x - z plane with $y = 0$.

For $x = 0$, $z = 4$. Hence, point P is at $(0, 0, 4)$.

For $z = 0$, $x = 2$. Hence, point Q is at $(2, 0, 0)$.

Vector \mathbf{A} from P to Q is:

$$\mathbf{A} = \hat{\mathbf{x}}(2 - 0) + \hat{\mathbf{y}}(0 - 0) + \hat{\mathbf{z}}(0 - 4) = \hat{\mathbf{x}}2 - \hat{\mathbf{z}}4,$$

$$\hat{\mathbf{a}} = \frac{\mathbf{A}}{|\mathbf{A}|} = \frac{\hat{\mathbf{x}}2 - \hat{\mathbf{z}}4}{\sqrt{20}}.$$
