

3.7 Given $\mathbf{A} = \hat{\mathbf{x}}(x + 2y) - \hat{\mathbf{y}}(y + 3z) + \hat{\mathbf{z}}(3x - y)$, determine a unit vector parallel to \mathbf{A} at point $P = (1, -1, 2)$.

Solution: The unit vector parallel to $\vec{A} = \hat{\mathbf{x}}(x + 2y) - \hat{\mathbf{y}}(y + 3z) + \hat{\mathbf{z}}(3x - y)$ at the point $P = (1, -1, 2)$ is

$$\frac{\vec{A}(1, -1, 2)}{|\vec{A}(1, -1, 2)|} = \frac{-\hat{\mathbf{x}} - \hat{\mathbf{y}}5 + \hat{\mathbf{z}}4}{\sqrt{(-1)^2 + (-5)^2 + 4^2}} = \frac{-\hat{\mathbf{x}} - \hat{\mathbf{y}}5 + \hat{\mathbf{z}}4}{\sqrt{42}} \approx -\hat{\mathbf{x}}0.15 - \hat{\mathbf{y}}0.77 + \hat{\mathbf{z}}0.62.$$
