

**3.1** Given vectors  $\mathbf{A} = \hat{x}2 - \hat{y}3 + \hat{z}$ ,  $\mathbf{B} = \hat{x}2 - \hat{y} + \hat{z}3$ , and  $\mathbf{C} = \hat{x}2 + \hat{y}1 - \hat{z}1$ , show that  $\mathbf{C}$  is perpendicular to both  $\mathbf{A}$  and  $\mathbf{B}$ .

**Solution:**

$$\mathbf{A} \cdot \mathbf{C} = (\hat{x}2 - \hat{y}3 + \hat{z}) \cdot (\hat{x}2 + \hat{y}1 - \hat{z}1) = 4 - 3 - 1 = 0,$$

$$\mathbf{B} \cdot \mathbf{C} = (\hat{x}2 - \hat{y} + \hat{z}3) \cdot (\hat{x}2 + \hat{y}1 - \hat{z}1) = 4 - 1 - 3 = 0.$$

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