

If $\mathbf{A} = 3\mathbf{i} - \mathbf{j} - 2\mathbf{k}$, $\mathbf{B} = \mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$, Find (1) $\mathbf{A} \cdot \mathbf{B}$, (2) the angle between $\mathbf{A}$ and $\mathbf{B}$, (3) the projection of $\mathbf{A}$ on $\mathbf{B}$. [103雲科大電子4(a)(c)(d)]

[解](1) $\mathbf{A} \cdot \mathbf{B} = 3 - 2 + 6 = 7$

$$(2) \mathbf{A} \cdot \mathbf{B} = |\mathbf{A}| |\mathbf{B}| \cos \theta \Rightarrow \theta = \cos^{-1} \frac{\mathbf{A} \cdot \mathbf{B}}{|\mathbf{A}| |\mathbf{B}|} = \cos^{-1} \frac{7}{\sqrt{3^2 + (-1)^2 + (-2)^2} \sqrt{1^2 + 2^2 + (-3)^2}} = 60^\circ$$

$$(3) \left(\mathbf{A} \cdot \frac{\mathbf{B}}{|\mathbf{B}|} \right) \frac{\mathbf{B}}{|\mathbf{B}|} = \frac{7}{14} (\mathbf{i} + 2\mathbf{j} - 3\mathbf{k}) = \frac{\mathbf{i} + 2\mathbf{j} - 3\mathbf{k}}{2}$$