Each problem is worth 5 points. Clear and complete justification is required for full credit.

Let $\mathbf{a} = 3\mathbf{i} - 2\mathbf{k}$, and $\mathbf{b} = -2\mathbf{i} + 5\mathbf{j} - \mathbf{k}$.

1. Find $\mathbf{a} \cdot \mathbf{b}$.

2. Find $\mathbf{a} \times \mathbf{b}$.