Problems from Serway

- Problem 11.1
- Problem 11.2
- Problem 11.3
- Problem 11.4
- Problem 11.6
- Problem 11.7
- Problem 11.10

Other Problems

- The vector triple product $\mathbf{A} \times (\mathbf{B} \times \mathbf{C})$ can be simplified by the so-called $\mathbf{BAC} - \mathbf{CAB}$ rule:
$$\mathbf{A} \times (\mathbf{B} \times \mathbf{C}) = \mathbf{B}(\mathbf{A} \cdot \mathbf{C}) - \mathbf{C}(\mathbf{A} \cdot \mathbf{B}). \tag{1}$$
Prove the $\mathbf{BAC} - \mathbf{CAB}$ rule by writing out both sides in component form.

- Which of the following statements about general vectors $\mathbf{a}$, $\mathbf{b}$, and $\mathbf{c}$ are true?
  1. $\mathbf{c} \cdot (\mathbf{a} \times \mathbf{b}) = (\mathbf{b} \times \mathbf{a}) \cdot \mathbf{c}$
  2. $\mathbf{a} \times (\mathbf{b} \times \mathbf{c}) = (\mathbf{a} \times \mathbf{b}) \times \mathbf{c}$
  3. $\mathbf{a} \times (\mathbf{b} \times \mathbf{c}) = (\mathbf{a} \cdot \mathbf{c})\mathbf{b} - (\mathbf{a} \cdot \mathbf{b})\mathbf{c}$
  4. $\mathbf{d} = \lambda\mathbf{a} + \mu\mathbf{b}$ implies $(\mathbf{a} \times \mathbf{b}) \cdot \mathbf{d} = 0$
  5. $\mathbf{a} \times \mathbf{c} = \mathbf{b} \times \mathbf{c}$ implies $\mathbf{c} \cdot \mathbf{a} - \mathbf{c} \cdot \mathbf{b} = c|\mathbf{a} - \mathbf{b}|$
  6. $(\mathbf{a} \times \mathbf{b}) \times (\mathbf{c} \times \mathbf{b}) = \mathbf{b}[\mathbf{b} \cdot (\mathbf{c} \times \mathbf{a})]$