

# PH 221 Week 7

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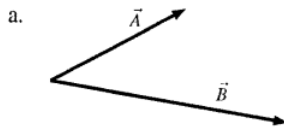
Winter 2025

This material is borrowed/adapted from Chapter 9 of the *Student Workbook for Physics for Scientists and Engineers*.

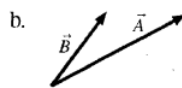
## R7-1: Visual Dot Product Practice

(a) If  $\vec{A} \cdot \vec{B} = 0$ , can you conclude that one of the vectors has zero magnitude? Explain.

(b) For each pair of vectors, is the sign of  $\vec{A} \cdot \vec{B}$  positive (+), negative (−), or zero (0)?



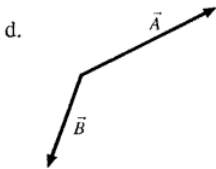
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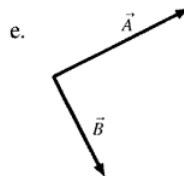
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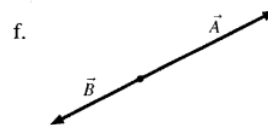
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(c) Each of the diagrams below shows a vector  $\vec{A}$ . Draw and label a vector  $\vec{B}$  that will cause  $\vec{A} \cdot \vec{B}$  to have the sign indicated.



$\vec{A} \cdot \vec{B} > 0$



$\vec{A} \cdot \vec{B} < 0$



$\vec{A} \cdot \vec{B} = 0$

## R7-2: Lifting Boxes

Rudy picks up a 5 kg box and lifts it straight up, at constant speed, to a height of 1 m. Beth uses a rope to pull a 5 kg box up a  $15^\circ$  frictionless slope, at constant speed, until it has reached a height of 1 m. Which of the two does more work? Or do they do equal amounts of work? Explain.

## R7-3: Spring Reasoning

A spring has an unstretched length of 10 cm. It exerts a restoring force  $F$  when stretched to a length of 11 cm.

- (a) For what length of the spring is its restoring force  $3F$ ?
- (b) At what compressed length is the restoring force  $2F$ ?