

## Subtracting Vectors

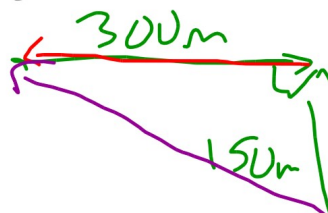
Example 1: Gabe and Taylor meet at the corner of 6th and 16th street (by the church). Gabe walked 150m [N] to get there. Taylor walked 300m [E] to get there. How far apart were they when they started?

$$c^2 = a^2 + b^2$$

$$c^2 = 300^2 + 150^2$$

$$\dots$$

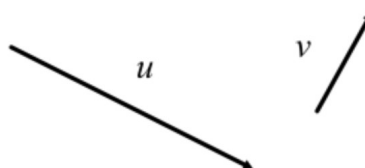
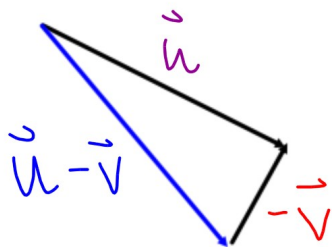
$$c = 335.4 \text{ m}$$



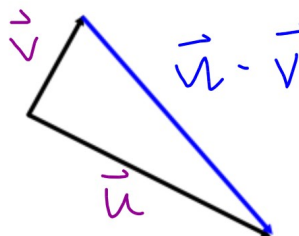
### Subtracting Vectors

$$\vec{u} - \vec{v}$$

*Tip to Tail:*



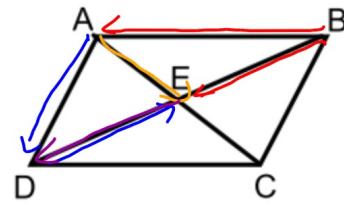
*Tail-to-tail:*



Example 2: Consider the parallelogram shown.

1. What vector is equivalent to  $\vec{AD} - \vec{AB}$ ?

$$\vec{BD}$$



2. Write  $\vec{AE}$  as a difference of two vectors in two ways.

$$\vec{AD} + \vec{DE} \rightarrow \vec{AD} - \vec{ED}$$

$$\vec{BE} - \vec{BA}$$

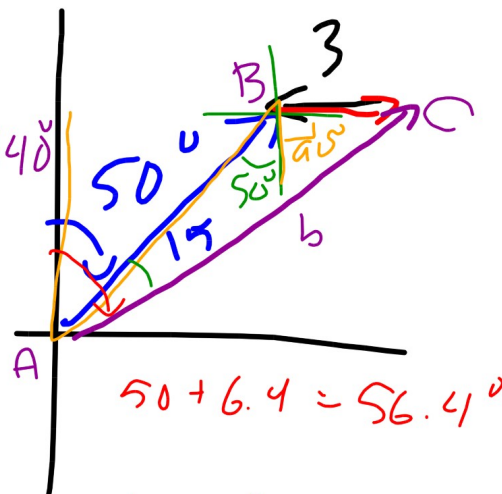
Example 3: A boat needs to travel at 15km/h [N50E] but there is a current of 3km/h [W]. What heading does the boat actually need to set?

$$b^2 = 3^2 + 15^2 - 2(3)(15)\cos 140^\circ$$

$$b = 17.4$$

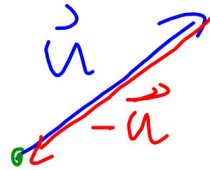
$$\frac{\sin A}{3} = \frac{\sin 140^\circ}{17.4}$$

$$A = 6.4^\circ$$



The heading is 17.4 km/h [N56.4E]

Ex. 4 What is  $\vec{u} - \vec{u}$ ?



zero vector:  $\vec{0}$

Practice: pg. 55 #1, 2, 6, 8, 12