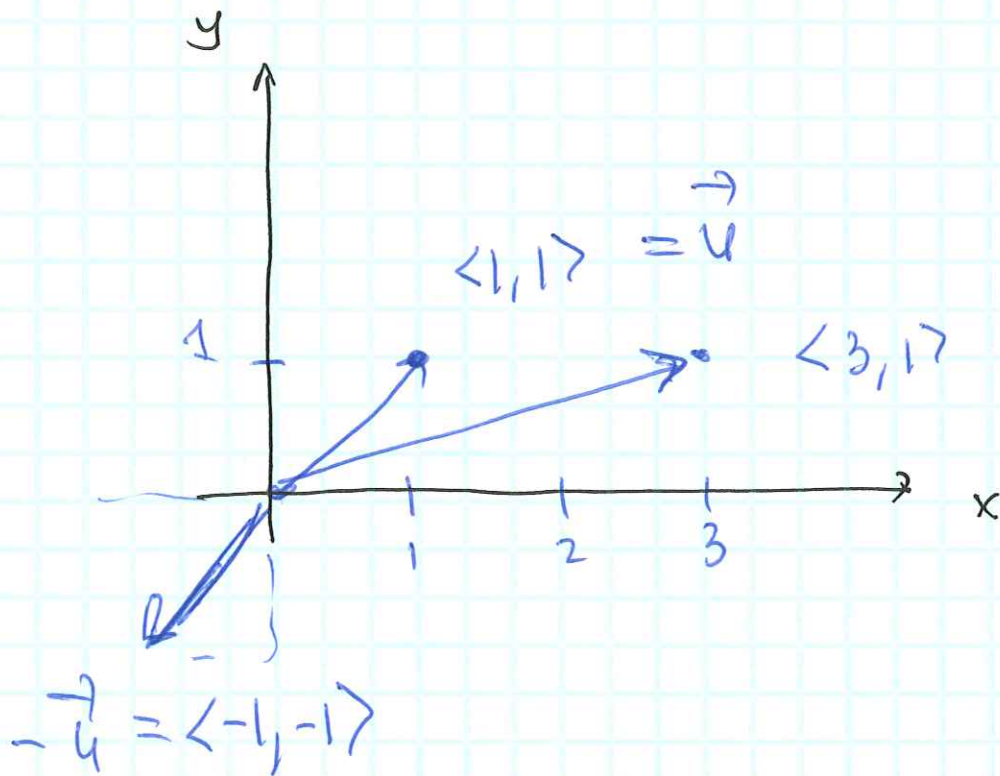


8/28/19 -①

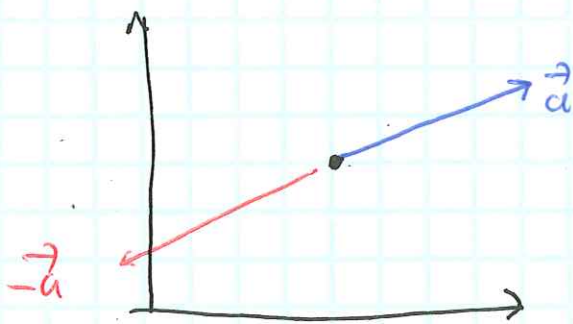
$$1) \vec{DE} = \vec{EB}$$

$$2) \vec{DA} = \vec{CB}$$

$$3) \vec{AB} = \vec{DC}$$



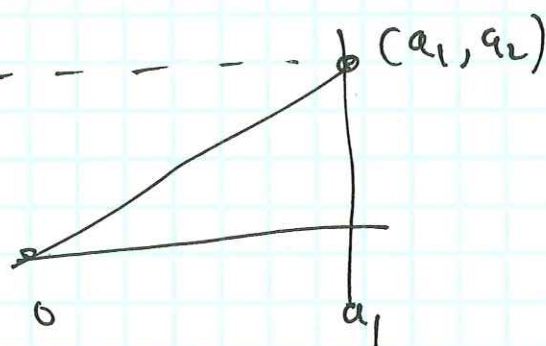
8/28/19 - (2)



length of a vector

$$\vec{a} = \langle a_1, a_2 \rangle$$

$$|\vec{a}| = \sqrt{a_1^2 + a_2^2}$$



$$\vec{a} = \langle a_1, a_2, a_3 \rangle$$

$$|\vec{a}| = \sqrt{a_1^2 + a_2^2 + a_3^2}$$

---

$$\vec{a} = \langle 1, 0, -1 \rangle$$

$$\vec{b} = \langle 2, 1, 3 \rangle$$

Find:

$$\vec{a} + \vec{b}$$

$$2\vec{b} - \vec{a}$$

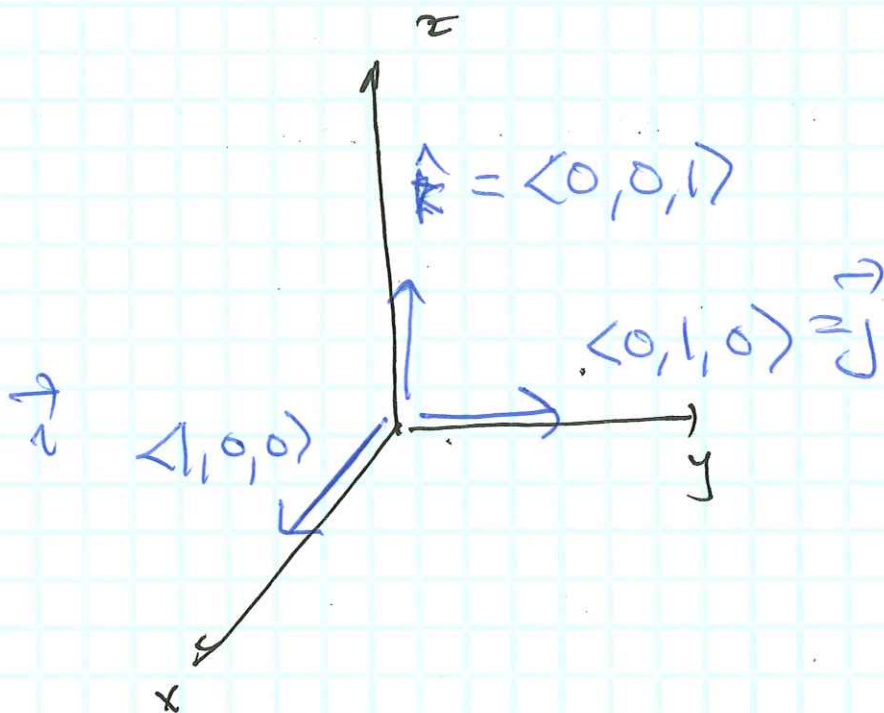
$$|\vec{a} + \vec{b}|$$

8/28/19-③

$$\vec{a} + \vec{b} = \langle 3, 4, 2 \rangle$$

$$2\vec{b} - \vec{a} = \langle 4, 2, 6 \rangle - \langle 1, 0, -1 \rangle = \langle 3, 2, 7 \rangle$$

$$|\vec{a} + \vec{b}| = \sqrt{9 + 16 + 4} = \sqrt{29}$$



$$\vec{a} = 2\hat{i} + 3\hat{j} = \langle 2, 3, 0 \rangle$$

$$|\vec{a}| = \sqrt{4 + 9} = \sqrt{13}$$

$$\hat{a} = \left\langle \frac{2}{\sqrt{13}}, \frac{3}{\sqrt{13}}, 0 \right\rangle$$

$$\begin{aligned} |\vec{a}| &= \sqrt{\frac{4}{13} + \frac{9}{13}} \\ &= \sqrt{\frac{13}{13}} = 1 \end{aligned}$$

4

$$\hat{i} = \langle 1, 0, 0 \rangle$$

$$\hat{j} = \langle 0, 1, 0 \rangle$$

$$\hat{k} = \langle 0, 0, 1 \rangle$$

$$\begin{aligned} |\langle a_1, a_2, a_3 \rangle| &= |a_1 \hat{i} + a_2 \hat{j} + a_3 \hat{k}| \\ &= \sqrt{a_1^2 + a_2^2 + a_3^2} \end{aligned}$$

---

$$\vec{a} = \hat{i} + 2\hat{j} = \langle 1, 2, 0 \rangle$$

$$|\vec{a}| = \sqrt{1^2 + 2^2 + 0^2} = \sqrt{5}$$

$$\hat{a} = \frac{1}{|\vec{a}|} \vec{a} = \frac{1}{\sqrt{5}} \langle 1, 2, 0 \rangle = \left\langle \frac{1}{\sqrt{5}}, \frac{2}{\sqrt{5}}, 0 \right\rangle$$

---

$$\vec{b} = \hat{i} + \hat{j} + \hat{k} = \langle 1, 1, 1 \rangle$$

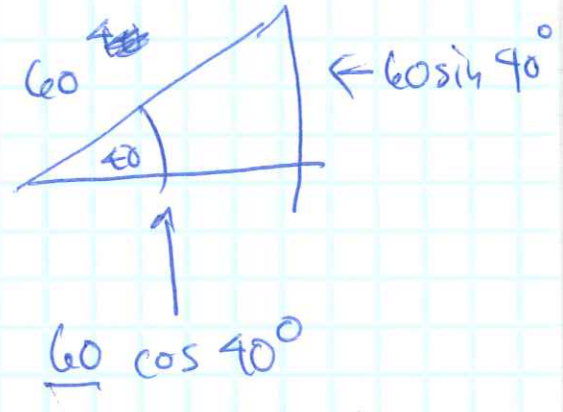
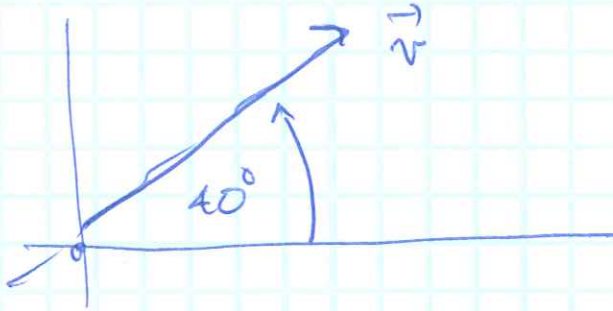
$$|\vec{b}| = \sqrt{1^2 + 1^2 + 1^2} = \sqrt{3}$$

$$\hat{b} = \frac{1}{\sqrt{3}} \langle 1, 1, 1 \rangle = \left\langle \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}} \right\rangle$$

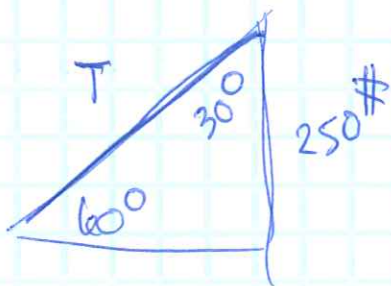
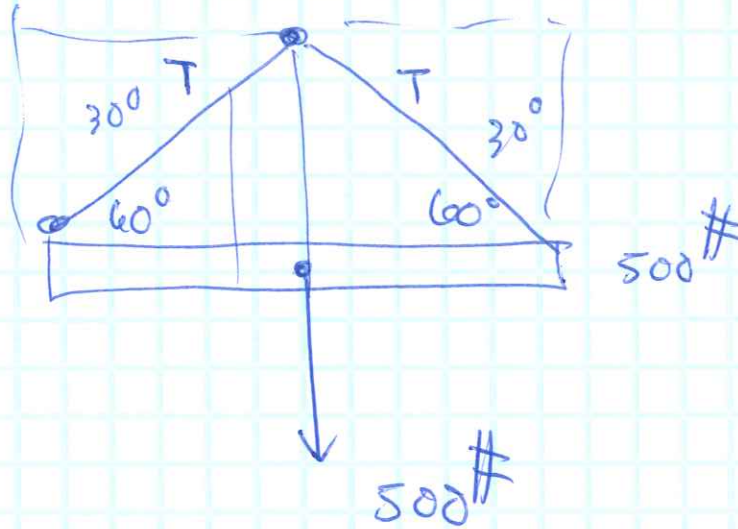
$$|\vec{v}| = 60 \text{ ft/sec.}$$

(5)

(1)



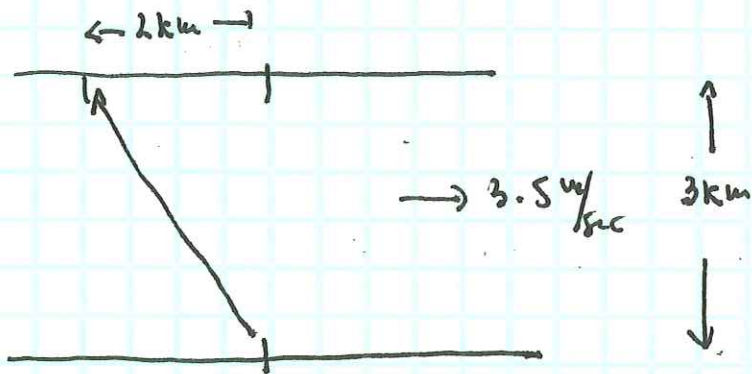
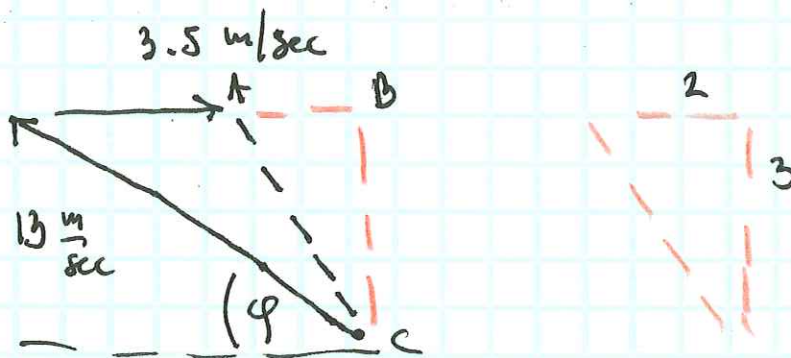
(2)



$$T \cos 30^\circ = 250$$

$$T \cdot 0.866 = 250$$

$$T = 289.683$$

Boat ProblemVelocities

The red triangles should be similar to get the net velocity of the boat right

$$AB = 13 \cos \phi - 3.5$$

$$BC = 13 \sin \phi$$

$$\frac{AB}{BC} = \frac{2}{3}$$

$$\therefore \frac{13 \cos \phi - 3.5}{13 \sin \phi} = \frac{2}{3}$$

Now solve for  $\phi$