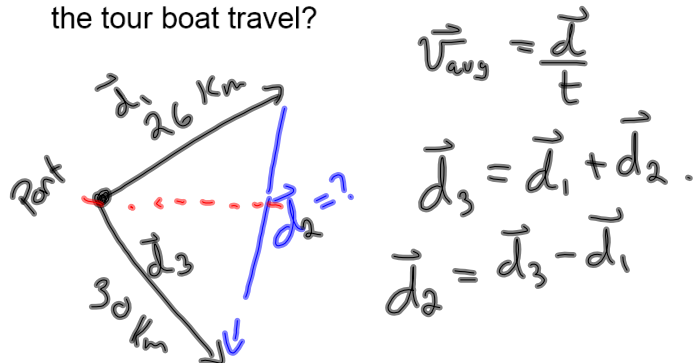Physics 122: Application of Vectors Examples

8. An inept boating tour guide takes you to a point 26 km [E33°N] from port when in fact you should be located 30 km [E33°S]. To get to your proper destination in 0.75 hours, with what velocity should the tour boat travel?

$$\vec{v}_{avg} = \frac{\vec{d}}{t}$$

$$\vec{d}_3 = \vec{d}_1 + \vec{d}_2.$$

$$\vec{d}_2 = \vec{d}_3 - \vec{d}_1$$

$$d_{3E} = 30\cos 33$$
$$= 25.2 \text{ km}$$

$$d_{3N} = -30\sin 33$$
$$= -16.3 \text{ km}$$

$$d_{1E} = 26\cos 33$$
$$= 21.8 \text{ km}$$

$$d_{1N} = 26\sin 33$$
$$= 14.2 \text{ km}$$

$$d_{2E} = d_{3E} - d_{1E}$$
$$= 25.2 - 21.8$$
$$= 3.4 \text{ km}$$
East

$$d_{2N} = d_{3N} - d_{1N}$$
$$= -16.3 - 14.2$$
$$= -30.5 \text{ km}$$
South

$$d_2 = \sqrt{d_{2E}^2 + d_{2N}^2} = \sqrt{(3.4)^2 + (-30.5)^2}$$
$$= 30.7 \text{ km}$$

$$\theta = \tan^{-1}\left|\frac{d_{2N}}{d_{2E}}\right| = \tan^{-1}\left|\frac{30.5}{3.4}\right| = 84°$$

$$\vec{d}_2 = 30.7 \text{ km } [E84°S]$$

$$\vec{v}_{avg} = \frac{\vec{d}}{t} = \frac{30.7}{0.75} = 40.9 \text{ km/h } [E84°S]$$