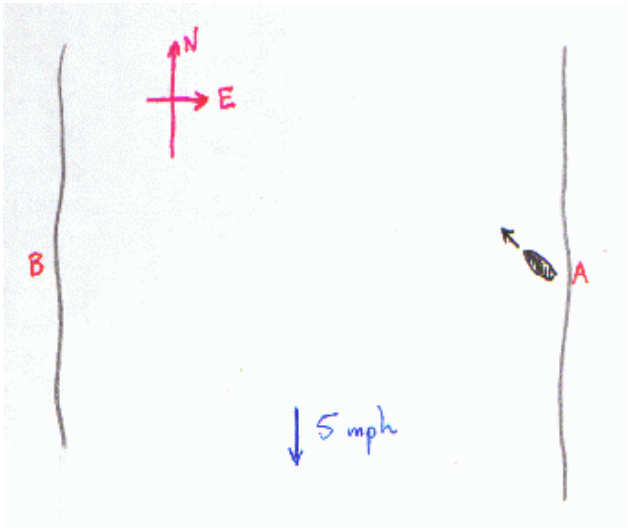
# DAY 16

## Homework Assignment (see syllabus for homework collection information)

1. A boater wants to cross a river that has a current of 5 mph and measures 0.75 miles in width. If the boat can travel at 20 mph through the water, what heading must it take in order to travel from A and arrive directly across the river at B?



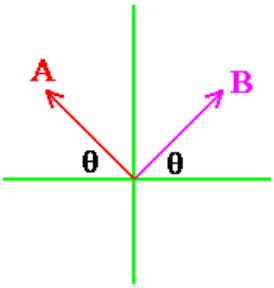

2. For a boat trying to cross from point A on one shore of a river to point B on the opposite shore, come up with a general equation for the heading angle in terms of the boat speed $v_{boat}$ and the current speed $v_{current}$. Show that when $v_{boat} = v_{current}$ the heading is 90° and when $v_{current} = 0$ the heading is 0° (measured off a line running from A to B).

3. In the 1st example problem for today, what 4th force $\mathbf{F_4}$ would result in

   $\mathbf{F_1} + \mathbf{F_2} + \mathbf{F_3} + \mathbf{F_4} = 0$?

4. In the figure shown, vectors **A** & **B** have the same magnitude (10 m), and the angle that **A** makes with the negative axis is the same as the angle **B** makes with the positive x axis.

   Find **A** + **B** for the following:




   $\theta = 0°$
   $\theta = 15°$
   $\theta = 30°$
   $\theta = 60°$
   $\theta = 75°$
   $\theta = 90°$

5. In the above problem, discuss what doesn't change with $\theta$ and why not.

6. A bird leaves its nest on Monday and flies 50 miles due N. On Tuesday it flies 50 miles due E. On Thursday it flies 25 miles due N again. On Friday it flies 20 miles @ 45° S of W, and arrives back at its nest.

   How did the bird travel on Wednesday?

7. **PHY 231 Only**
   Rework example #3 but this time have the tracking telescope located directly under the peak of the projectile's arc.

8. **PHY 231 Only**
   A heavy rock dropped from the top of a 100 m tall cliff is tracked as it falls by a telescope located 100 m from the cliff's base. Calculate the slewing speed of the telescope when the rock is half-way down the cliff and when the rock is about to hit the ground. Can you solve this without using calculus?