Chapter 3 Even Problem Solutions

#12. The magnitude of the vector is:

$$||34\hat{\imath} + 13\hat{\jmath}|| = \sqrt{34^2 + 13^2} = 36.4m$$

The angle it makes with the x-axis is:

$$\theta = \tan^{-1}(\frac{13}{34}) = 21°$$

#28. The x component is:

$$V_x = 18\frac{m}{s} * \cos(220°) = -13.8\frac{m}{s}$$

The y component is:

$$V_y = 18\frac{m}{s} * \sin(220°) = -11.6\frac{m}{s}$$

#48. Let us make a few definitions. Let us define y to be the direction in which the river flows, and x to be the "directly across" direction. Therefore, the river flows with velocity $\vec{v_r} = .57\frac{m}{s}\hat{\jmath}$. We will row, with respect to the shores, with a velocity $\vec{v} = v_x\hat{\imath} + v_y\hat{\jmath}$. Therefore, our total velocity is: $\vec{v_T} = \vec{v} + \vec{v_r} = v_x\hat{\imath} + (v_y + .57\frac{m}{s})\hat{\jmath}$.

a. We want our **total** velocity to be 0 in the y direction. This is the definition of rowing "straight across". Therefore, we find immediately that:

$$v_y = -.57\frac{m}{s}$$

We also know that we can row with total speed of $1.3\frac{m}{s}$, therefore:

$$1.3\frac{m}{s} = \sqrt{v_x^2 + v_y^2} = \sqrt{v_x^2 + (.57)^2}$$

Solving this we get that:

$$v_x = 1.17\frac{m}{s}$$

Because our y direction velocity is negative, we know we want to go against the flow of the river, or in the $-y$ direction. We can define the direction we want to go as the angle **below** the x axis:

$$\theta = \tan^{-1}(\frac{.57}{1.17}) = 26°$$

b. We just noted that our (total) velocity in the x direction is $v_x = 1.17\frac{m}{s}$, therefore:

$$t = \frac{63m}{1.17\frac{m}{s}} = 54s$$