Problem 3.11

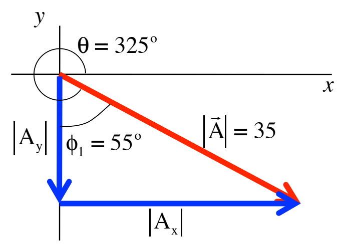
We are given the magnitude and angle, which in polar notation looks like:

$$\vec{A} = 35\measuredangle 325^\circ$$

Note that this could also be written

$$\vec{A} = 35\measuredangle -35^\circ$$

A graphical representation of this vector is shown to the right (though not to scale) with supplementary angles and the unknown components shown.



Using the right triangle we've generated and trig functions, we an write:

$$|A_x| = |\vec{A}|\sin\phi_1 = (35)\sin 55^\circ = 28.7$$

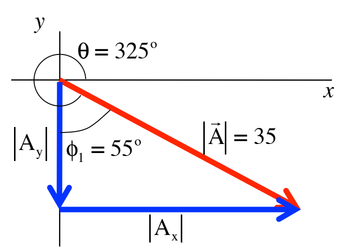
(as "sine" is associated with the side OPPOSITE the angle you know)

1.)

and

$$|A_y| = |\vec{A}|\cos\phi_1 = (35)\cos 55^\circ = 20.1$$

(as "cosine" is associated with the side ADJACENT to the angle you know)



Because we are using a contrived triangle to get the magnitude of the components, we have to manually put in the signs. The "x" component is in the +x direction and the "y" component in the –y direction, so we write:

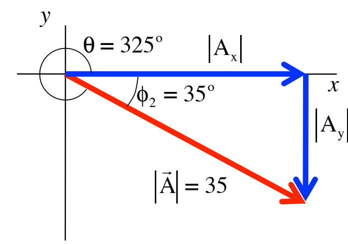
$$\vec{A} = 28.7\hat{i} + 20.1\left(-\hat{j}\right),$$

or more traditionally:

$$\vec{A} = 28.7\hat{i} - 20.1\hat{j}$$

2.)

Note that you could have used a different triangle to get the magnitudes. In that case:



$$|A_x| = |\vec{A}|\cos\phi_2 = (35)\cos 35^\circ = 28.7$$

and

$$|A_y| = |\vec{A}|\sin\phi_2 = (35)\sin 35^\circ = 20.1$$

Different angle, different trig function but the same component magnitudes (not surprising). The only thing that is tricky is that you have to use the angle that goes with the triangle. Just because the vector can be written as $\vec{A} = 35\measuredangle -35^\circ$ doesn't mean the angle to be used is -35°! This is a first quadrant right-triangle. Its acute angles are greater than zero degrees (just look at the sketch!). Anyway, the solution in both cases is:

$$\vec{A} = 28.7\hat{i} - 20.1\hat{j}$$

3.)