1. (10 points) A glider (an airplane without an engine) is flying at a velocity of 50 km/hour 36.9° north of east. The wind is blowing with a velocity of 28.3 km/hour 45° south of west.

   a. Consider the positive x-direction to be east and the positive y-direction to be north. Find the x- and y-components of each vector.

   b. On the grid below, sketch in these two vectors. I recommend using the dot as the origin of your coordinate system. (You don’t need a straight edge or protractor – use your answers to part a to place the vectors.)

   c. Sketch in the resultant of adding the two vectors in the drawing above (tip-to-tail method).

   d. What are the magnitude and direction of the resultant vector? Calculate these – don’t use your sketch.
2. (10 points) A ball is thrown into the air with an initial velocity of 15.0 m/s at an angle of 25.0 ° above the horizontal. Ignore air resistance in the following.

   a. What are the horizontal and vertical components of velocity of the ball initially?

   b. How high vertically will the ball go into the air?

   c. How long (in s) will it take for the ball to come back down to the same height at which it left the thrower’s hand?

   d. Suppose the same throw of the ball is made on a planet on which the acceleration due to gravity is given by the expression $g(t) = 1.5 t^2$. Remembering that $a = \frac{dv}{dt}$ and, as a result, $dv = adt$, how fast would the ball be traveling after 2.0-s?

\[
\begin{align*}
v &= v_o + gt \\
y &= y_o + v_o t + \frac{1}{2} gt^2 \\
v^2 &= v_o^2 + 2g(y - y_o) \\
\bar{v} &= \frac{v + v_o}{2}
\end{align*}
\]