1. Let $u = (3, 4)$ and $v = (-5, 12)$. Compute

    (a) the lengths of u and v.

    (b) the unit vectors of u and v.

    (c) the dot product of u and v.

    Use your computations to determine whether the angle between u and v is acute, right, or obtuse. Draw u and v to check.

2. Let $u = 2\hat{i} - 3\hat{j}$ and $v = 3\hat{i} + \hat{j}$. The goal of this exercise is to write u as the sum of two vectors u_1 and u_2 where u_1 is parallel to v and u_2 is perpendicular to v. The vector u_1 is called the *projection of u onto v*.

   (a) How long is the projection of u onto v? Draw a triangle and use trigonometry.

   (b) Since a vector is determined by its length and direction, we next determine the direction of the projection. What should the unit vector for the projection be?

   (c) Combine your answers to the previous two questions to determine u_1.

   (d) Now that you have u and u_1, find u_2.

   (e) Draw all four vectors on the same set of coordinate axes.