

**Second Examination**  
*Wednesday, September 23, 2009*

**Instructions:** This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. Each entire problem is worth 25 points. You may keep this question sheet.

1. Write down a vector  $\vec{u}$  of length 1 in the direction of  $\vec{v} = \vec{i} - \vec{j} + \vec{k}$ .
2. Assume East corresponds to the positive  $x$  axis and North corresponds to the positive  $y$  axis. An airplane is flying at 500 miles per hour in a direction that makes an angle  $\theta$ , measured counterclockwise, with respect to East, with  $\tan(\theta) = 3/4$ . At the altitude the plane is flying, a wind is blowing at 80 miles per hour from the west. What is the plane's ground speed and in what direction is it moving with respect to the ground?
3. By first computing a normal vector, write down an equation for the plane through the points  $(1, 0, 0)$ ,  $(1, 1, 0)$ , and  $(1, 1, 1)$ . Sketch a graph of the plane.
4. If  $\vec{u} = 2\vec{i} + \vec{j} + \vec{k}$  and  $\vec{v} = \vec{i} + \vec{j} + 0\vec{k}$ , compute the component of  $\vec{u}$  in the direction of  $\vec{v}$ .