Second Examination
Wednesday, February 27, 2008

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. You may keep this copy of the exam questions. Each entire problem is worth 25 points.

1. Find the equation of the plane through the points $(0, 0, 1)$, $(1, 0, 2)$, and $(1, 1, 3)$ by first computing a normal vector.

2. Find the equation of the plane parallel to the plane $x + y + z = 1$ and through the point $(2, 3, 4)$.

3. Suppose a coordinate system is such that north is in the direction of the positive vertical axis, east is in the direction of the positive horizontal axis, and angles are measured counterclockwise with respect to east. A plane is pointed southwest (an angle of $5\pi/4$ radians) with an air speed of 500 miles per hour. The plane is in a wind blowing directly from the west (that is, the wind vector has an angle of 0 radians), with a speed of 60 miles per hour. Find the ground speed and angle of motion of the plane.

4. Suppose the coordinate system is as in the previous problem. A bicycle rider rides due North (angle: $\pi/2$ radians) for 20 miles (105600 feet) while a wind is exerting a force of 15 pounds and is blowing from the east-northeast to the west-southwest. (Say, the angle of the wind vector is $7\pi/6$ radians.) How much work does the bicycle rider do to overcome the wind?