Math 152, Spring 2008, Practise Test #1

- This test was given in 2006.
- It was given slightly earlier in the term and so does not have any material on linear systems on it. Your test #1 may include basic material on solving linear systems.
- Marks are indicated in the questions, out of a total of 20.

1. (a) (2 marks) Find a vector normal to the plane containing the points [1,0,1], [1,1,0] and [0,1,1].
   (b) (2) Find the equation of the plane.
   (c) (1) Does the plane pass through the origin?
   (d) (1) Does the plane intersect the x (x_1) axis? If so, where?
   (e) (2) Is there a point p that lies both on this plane and on the x – y (x_1 – x_2) plane, such that the line from the origin through p and the line through the origin and [1,0,0] make an angle of π/3 (60°)? If so, find it. Recall that cos(π/3) = 1/2.

2. (a) (2) Find two vectors a_1 and a_2 such that every point in the plane x + 2y – z = 0 can be written as a linear combination of a_1 and a_2.
   (b) (2) Determine the closest point on the plane to [1,1,1] and write it as a linear combination of a_1 and a_2.
   (c) (2) What is the shortest distance between the plane and [1,1,1]?

3. (3) Find the value(s) of a such that the vectors [1,1,2], [0,2,1] and [1,3,a] are linearly dependent.

4. (3) The line L passing through the the origin and the point [1,1,1] passes through the midpoint of a thin metal rod of length 2 that is oriented in the direction [1,0,0]. The rod begins rotating about L at 3 revolutions per minute. What is the fastest speed (length of velocity vector) of any point on the rod?