Name:

 Student ID:

Test 3

This test is graded out of 30 marks. No books, notes, graphing calculators or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. (3 marks) Find the volume of the parallelpiped defined by $\mathbf{u} = (2, 0, -3)$, $\mathbf{v} = (-1, 1, -1)$ and $\mathbf{w} = (1, 0, 3)$.

Question 2. (3 marks) Find a vector perpendicular to both $\mathbf{u} = (2, 1, -3)$ and $\mathbf{v} = (-1, 1, -1)$.

Question 3. (3 marks) Determine if the line (x, y, z) = (1, 0, 2) + t(1, 2, 2) passes through the point (2, 2, 3).

Question 4. (2 marks) Is the line (x, y, z) = (1, 2, -2) + t(-1, 3, -5) perpendicular to the plane 2x - 6y + 10z = 11, justify.

Question 5. (2 marks) Is the plane -x + y - 2z = 31 perpendicular to the plane 4x + 2y - z = 10, justify.

Question 6. (3 marks) Find the equation of the plane passing through the points A(1,2,-3), B(2,1,0) and C(0,1,-3).

Question 7. (4 marks) Determine the distance between the point P(2,1,1) and the plane -2x + y - z = 10. (using projections)

Question 8. Given the following two planes x - y + 3z = 2 and -2x + y + 3z = 3.

- a. (4 marks) Find the parametric equation of the line of intersection of the two planes.
- b. (3 marks) Find the equation of the plane that contains the point (2,0,1) and the intersection of the plane.

Question 9. (5 marks) Maximize P = 4x + 5y + 4z subject to

 $-x + y + 2z \le 40$ $2x - y - z \le 10$

Bonus Question. (*3 marks*) Find the distance between the two lines (x, y, z) = (2 + t, -3t, 1) and (x, y, z) = (t, 1 - t, 3 + 2t).