1. Part I

There are 6 problems in Part 1, each worth 4 points. Place your answer on the line to the right of the question. Only your answer on the answer line will be graded.

(1) Find the cross product of the vectors \( \langle 2, 2, 1 \rangle \) and \( \langle 1, 0, 1 \rangle \).

(2) Find the dot product of the vectors \( \langle 2, -2, 4 \rangle \) and \( \langle 2, 1, -1 \rangle \).

(3) Find the vector equation that represents the curve of intersection of the cylinder \( x^2 + z^2 = 1 \) and the plane \( y = 2 \).

(4) Find the length of the arc with vector equation \( r(t) = \langle \cos t, \sin t \rangle \) from the point \( (1, 0) \) to the point \( (-1, 0) \).

(5) Find a vector function representing the line (a parametrization of the line) passing through the points \( P(0, 0, 0) \) and \( Q(0, 3, 2) \).

(6) Find an equation of the plane with normal \( \mathbf{i} + \mathbf{j} + \mathbf{k} \) which contains the point \( P(0, 0, 0) \).
2. Part II

There are 3 problems in Part 2, each worth 12 points. On Part 2 problems partial credit is awarded where appropriate. Your solution must include enough detail to justify any conclusions you reach in answering the question.

(1) A ball is thrown at an angle of 45 degrees to the ground. It lands $4/5m$ away.
   (a) Find the initial speed.
   (b) Find the maximum height reached.
   (c) Find the speed at impact.

Use $g = 10m/s^2$. 
(2) At what points does the curve \( r(t) = ti + 4j + (4t + 3t^2)k \) intersect the paraboloid \( z = x^2 + y^2 \).
(3) Find an equation of the plane passing through $A(1, 1, -1)$, $B(0, 1, 3)$, and $C(3, 2, 0)$. What is the angle between this plane and the $xz$-plane?