In questions 1-5, just give answers
In questions 6-8, no work — no points.

1. Is the following a vector or a scalar?
   
   (a) $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$
   
   (b) $(\mathbf{a} \times \mathbf{b}) \times \mathbf{c}$

   (2 points)

2. Calculate $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{a})$.

   (2 points)

3. Which of the following points lie on the plane $x + y - 2z = 1$ (indicate yes or no)

   (a) $A(-1, 2, 0)$,
   
   (b) $B(2, 3, 2)$,
   
   (c) $C(3, -2, -1)$.

   (3 points)

4. Which of the following vector pairs are parallel (indicate yes or no)

   $\langle 1, 0, 3 \rangle$ and $\langle 3, 0, -1 \rangle$,
   
   $\langle 2, -4, 8 \rangle$ and $\langle 1, -2, 4 \rangle$,
   
   $\langle 2, 3, 0 \rangle$ and $\langle -2, -3, 0 \rangle$.

   (3 points)
5. Sketch in the 3-dimensional space (if cannot sketch, describe in words in detail):

(a) \( y = x \),
(b) \( 2x^2 - y^2 + z^2 = -3 \),
(c) \( -x^2 - y^2 = 16 \).

**NB:** Draw the axes!  

(15 points)
6. Calculate the volume of the triangular pyramid with the base $A(0, 1, 2)$, $B(2, -1, 2)$, $C(1, 1, 0)$ and the apex (top) $D(2, 1, 1)$ using the formula

$$\text{Volume} = \frac{1}{3} \text{Area(base)} \times \text{Height},$$

where height is the distance from the base to the apex. **NB:** You must use the above formula, calculating the volume by any other means will not count.

(15 points)
7. Find the equation of the line $L_1$ passing through the point $A(2, 1, 1)$, parallel to the plane $P_1: x - y + 2z = 7$ and intersecting the line $L_2: x = 1 + t, y = 2 + t, z = -t$.

(15 points)
8. Find the length of the curve \( r(t) = (3t, 3t^2, 2t^3), \ 0 \leq t \leq 1. \) (5 points)