1. A 1x1x1 cube has corners P, Q, and R as shown on the right. Use vectors to find the angle between \( \overrightarrow{PQ} \) and \( \overrightarrow{PR} \).

2. a) Find an equation for the plane on the right which intersects the x-axis at 2, the y-axis at 3, and the z-axis at 6.
   b) What is the area of the triangle shown?

3. Let \( \mathbf{v} = \langle 1, 3 \rangle \) and \( \mathbf{w} = \langle 4, 2 \rangle \).
   a) Find the scalar \( \text{comp}_w \mathbf{v} \).
   b) Find the vector \( \text{proj}_w \mathbf{v} \).
   c) Draw \( \mathbf{v}, \mathbf{w}, \) and \( \text{proj}_w \mathbf{v} \) on the same set of axes.

4. Consider the two points A(1, 2, 3) and B(4, 0, 4).
   a) Write parametric equations for the line going through the points A and B.
   b) Where does this line intersect the y-z plane?
   c) Is your line in part (a) parallel to the plane \( 3x - 2y + z = 2 \)? Why?

5. Consider the curve in \( \mathbb{R}^3 \) given parametrically by \( x = \cos(t), y = t, z = \sin(t) \).
   a) Sketch by hand the curve in \( \mathbb{R}^3 \) (3 dimensional space).
   b) Find the position vector, velocity vector, speed, and acceleration vector at time \( t \) (\( \mathbf{r}(t), \mathbf{v}(t), \text{speed}(t), \text{and} \mathbf{a}(t) \)).
   c) Find \( \mathbf{r}(t), \mathbf{v}(t), \text{speed}(t), \text{and} \mathbf{a}(t) \) at time \( t = \pi / 4 \) and plot the vectors on your graph from part (a).
   d) Find parametric equations for the line tangent to your curve at the point corresponding to \( t = \pi / 4 \).
   e) Find the arc length of the curve as \( t : 0 \rightarrow 2\pi \).

6. State whether each of the following is a vector, a scalar, or makes no sense:
   \( \text{a) } (\mathbf{a} \cdot \mathbf{b})\mathbf{c} \quad \text{b) } \frac{\mathbf{c}}{\mathbf{a} \cdot \mathbf{b}} \quad \text{c) } \frac{\mathbf{a} \cdot \mathbf{b}}{\mathbf{c}} \quad \text{d) } (\mathbf{a} \times \mathbf{b}) \cdot |\mathbf{c}| \quad \text{e) } (\mathbf{a} \times \mathbf{b}) \times \mathbf{c} \quad \text{f) } \mathbf{a} \cdot (\mathbf{b} \times \mathbf{c}) \quad \text{g) } (\mathbf{a} \cdot \mathbf{b}) \times \mathbf{c} \quad \text{h) } (\mathbf{a} \cdot \mathbf{b}) + \mathbf{c} \)

7. Sketch for each of the following functions a graphs in \( \mathbb{R}^3 \):
   \( \text{a) } \mathbf{r}(t) = \langle t \cos(t), t \sin(t), t \rangle \quad \text{b) } z = y^2 \quad \text{c) } z = x^2 + \frac{y^2}{4} \)

8. Astronaut Allan Shepherd once hit a golf ball from the surface of the moon. If the ball left his club going 200 ft/sec and made an angle of 45° with the horizontal and gravity on the moon is only 1/6 of that on earth, how far did the golf ball go (horizontal distance in yards)? Start with accel \( \mathbf{a}(t) \) and show all of your work.