Homework Section 12.1

1. Plot the points (4, 0, 3), (3, 2, 5), (5,-4, -1), and (-3,5,- 2) together in \( \mathbb{R}^3 \) on the same set of axes.

2. Sketch the following planes in \( \mathbb{R}^3 \) (graph each separately):
   
   a) \( y = 2x + 1 \).
   
   b) \( y = 2 \).
   
   c) \( z = 3 \).
   
   d) \( 2x + 3y + z = 6 \).

3. Provide a written description of the given region in \( \mathbb{R}^3 \).
   
   a) \( z > 5 \).
   
   b) \( 0 < z \leq 5 \).
   
   c) \( x^2 + y^2 + z^2 > 4 \).

4. Find the distance between the points (1,-3, -4) and (-7, -5, 2).

5. Find the equation of a sphere with center (-5, 6, -8) and radius 7. What kind of geometric object is formed by the intersection of this sphere with the yz-plane? Find the equations that represent the intersection of the sphere with yz-plane.

6. Find the equation of a sphere that goes through (1,-3, -4) with center (-7, -5, 2). Use your work from number 4.

7. a) Sketch one period of the curve given by \( y = \sin x \) in the xy-plane.
   
   b) Sketch one period of the cylinder given by \( y = \sin x \) in \( \mathbb{R}^3 \).
   
   c) Sketch one period of the cylinder given by \( z = \sin x \) in \( \mathbb{R}^3 \).

8. Sketch the cylinders:
   
   a) \( z = e^x \)
   
   b) \( \frac{x^2}{4} + \frac{y^2}{9} = 1 \)