

Name:

1. Sketch a picture of  $\mathbb{R}^3$  with the point  $P(2, 5, 4)$  labeled.
2. Find the distance of the point  $P(2, 5, 4)$  to the  $xy$ -plane, the  $xz$ -plane, and the  $yz$ -plane. Which plane is it closest to?
3. For each of the following sets of equations, describe the object formed in  $\mathbb{R}^3$ .
  - (a)  $x = 3$
  - (b)  $\begin{cases} x = 3 \\ y = 5 \end{cases}$
  - (c)  $\begin{cases} x = 3 \\ y = 5 \\ z = -6 \end{cases}$
4. What region is represented by  $1 \leq x^2 + y^2 + z^2 \leq 4$ .

5. Consider the vectors  $\vec{a} = \langle 3, 1, 5 \rangle$  and  $\vec{b} = \langle 0, 2, 0 \rangle$ . Which vector is longer,  $\text{proj}_{\vec{a}}\vec{b}$  or  $\text{proj}_{\vec{b}}\vec{a}$ ?

6. A wagon is pulled a distance of 2km along a horizontal path by a constant force of 70N. The handle of the wagon is held at an angle of  $35^\circ$  above the horizontal. Find the work done by the force.

7. A particle is moved from the point  $P(0, 2, 1)$  to  $Q(3, 4, 2)$  by a force given by the vector  $\vec{F} = 2i + j + 4k$ . Find the work done.