

Math 253A - Accelerated Calculus III

Problem sheet 1

01/09/2019

Problem 1

Describe the sets of points (x, y, z) in the three dimensional space that satisfy the following conditions:

- $0 \leq x \leq 1, 0 \leq y \leq 1.$
- $x^2 + y^2 \leq 2, z = 3.$
- $x^2 + y^2 = 2, y \geq 0.$
- The set of points equidistant from the origin and the point $(0, 0, 2)$. Give an equation for this set.

Problem 2

- Find the radius and the center of the sphere

$$3x^2 + 3y^2 + 3z^2 + 2y - 2z + 1 = 10.$$

- Find the equation of the sphere with center $(2, 6, 4)$ that passes through the origin.
- Give an inequality to describe the half space of points on and below the xy -plane.
- Find a pair of equations for the intersection of the cone $z = x^2 + y^2$ with the plane $z = 4$. Describe the set of all intersection points.

Problem 3

- Compute the distance between the points $P = (1, 2, 3)$ and $Q = (3, 2, 1)$.
- Give the component form of the vectors \overrightarrow{PQ} and \overrightarrow{QP} . Show that $\overrightarrow{PQ} = -\overrightarrow{QP}$.
- Calculate the magnitudes of the vectors \overrightarrow{PQ} and $-4\overrightarrow{QP} + \overrightarrow{PQ}$.
- Find the components of the vector $3\vec{u} - 2\vec{v}$ for $\vec{u} = \langle -1, 0, -3 \rangle$ and $\vec{v} = \langle 1, -1, 2 \rangle$.