MATH 104: WORKSHEET 4

1. Concepts

(1) Vector equations for a line through $\vec{r_0}$ and parallel to the direction vector $\vec{v}$

$$\vec{r} = \vec{r_0} + \vec{v}t\,.$$

(2) Parametric equations for a line through a point (x_0, y_0, z_0) and parallel to the direction vector $\langle a, b, c\rangle$ is

$$x = x_0 + at\,, y = y_0 + bt\,, z = z_0 + ct\,.$$

(3) Symmetric equation of the above line is

$$\frac{x - x_0}{a} = \frac{y - y_0}{b} = \frac{z - z_0}{c}\,.$$

(4) Scalar equation of a plane through $P_0 = (x_0, y_0, z_0)$ with normal vector $\vec{n} = \langle a, b, c\rangle$ is

$$a(x - x_0) + b(y - y_0) + c(z - z_0) = 0\,.$$

2. Problems

Question 1. Find the volume of the parallelepiped with the edges PQ, PR, PS, where

$$P = (-2, 1, 0)\,, Q = (2, 3, 2)\,, R = (1, 4, -1)\,, S = (3, 6, 1)\,.$$

Question 2. Do the following points lie on the same plane?

$$A = (1, 3, 2)\,, B = (3, -1, 6)\,, C = (5, 2, 0)\,, D = (3, 6, -4)\,.$$

Date: 01/20/2024.

Question 3. Find a vector equation of plane through $P_0 = (x_0, y_0, z_0)$ with directions $\vec{v_1}$ and $\vec{v_2}$.

Question 4. Find an equation that describes the line segment from (a_1, a_2, a_3) to (b_1, b_2, b_3).

Question 5. Find a formula to find the distance between a point P to a line in $\mathbb{R}^3$.

Question 6. Find a formula to find the distance between a point P to a plane in $\mathbb{R}^3$.