

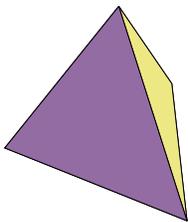
This is part 1 (of 3) of the homework which is due July 8 at the beginning of class.

SUMMARY.

- $\vec{r}(t, s) = P + t\vec{v} + s\vec{w}$ **parametric equation** for a **plane**. $P = (x_0, y_0, z_0)$ a point \vec{v}, \vec{w} are vectors.
- $ax + by + cz = d$, **implicit equation** for a **plane**.
- $\vec{r}(t) = P + t\vec{v}$ **parametric equation** for a line, P a point, \vec{v} is a vector.
- $\frac{x-x_0}{a} = \frac{y-y_0}{b} = \frac{z-z_0}{c}$ **symmetric equation** for a line.

Homework Problems

- 1) (4 points)
 - a) (3) Find the distance between the point $(2, -1, 2)$ and the plane $4x - 2y + z = 2$.
 - b) (1) If no absolute value is taken in the distance formula, what does the sign of the result say?
- 2) (4 points) A regular tetrahedron has vertices at the points $P_1 = (0, 0, \sqrt{3}), P_2 = (0, 2\sqrt{2/3}, -1/\sqrt{3}), P_3 = (-\sqrt{2}, -\sqrt{2/3}, -1/\sqrt{3})$ and $P_4 = (\sqrt{2}, -\sqrt{2/3}, -1/\sqrt{3})$. Find the distance between two edges which do not intersect.



- 3) (4 points) Find the equation for the plane which contains the three points $P = (1, 2, 3), Q = (3, 4, 4)$ and $R = (1, 1, 2)$.
- 4) (4 points)
 - a) (2) Find the parametric equation for the line which passes through the points $P = (1, 2, 3)$ and $Q = (3, 4, 5)$.
 - b) (2) Find the symmetric equation for the same line.
- 5) (4 points) Find a parametric equation for the line through the point $P = (3, 1, 2)$ that is perpendicular to the line $L : x = 1 + t, y = 1 - t, z = 2t$ and intersects this line.

Challenge Problems

(Solutions to these problems are **not** turned in with the homework.)

- 1) How does one describe a three dimensional "hyperplane" in four dimensional space? Find a parametric description and an implicit description.
- 2) Can you find a line and a two dimensional plane in \mathbf{R}^4 which are not parallel and which do not intersect? How would you compute the distance between a line and a two dimensional plane in \mathbf{R}^4 ?