

Mathematics 3A

HSLU, Semester 3

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Part I

Just stuff I have to explain, wait few days

Let π denote the plane:

$$s_y \in \pi, s_y \in \pi, s_z \in \pi$$

$$\pi : ax + by + cz + d = 0$$

For $S_x \in \pi \implies 1a + 0b + 0c + d = 0$, hence
 $a + d = 0$

For $S_y \in \pi \implies 0a + 2b + 0c + d = 0$, hence
 $2b + d = 0$

for $S_z \in \pi \implies 0a + 0b + 3c + d = 0$, hence
 $3c + d = 0$

$$\begin{cases} a + d = 0 \\ 2b + d = 0 \\ 3c + d = 0 \end{cases} \implies \begin{cases} a = -d \\ 2b = -d \\ 3c = -d \end{cases}$$

Case 1:

$$d = 0 \implies a = 0, b = 0, c = 0 \implies \pi : 0 = 0 \implies \text{NOT a plane!}$$

Case 2:

$$d \neq 0 \implies \pi : \frac{ax + by + cz + d}{d} = 0 \implies \frac{a}{d}x + \frac{b}{d}y + \frac{c}{d}z + 1 = 0$$

Hence:

$$\begin{cases} a = -d \\ 2b = -d \\ 3c = -d \end{cases} \implies \begin{cases} \frac{a}{d} = -1 \\ \frac{b}{d} = -\frac{1}{2} \\ \frac{c}{d} = -\frac{1}{3} \end{cases}$$

Which leads to:

$$\pi : -x - \frac{1}{2}y - \frac{1}{3}z + 1 = 0$$

Remark: the equation of a plane is defined up to a multiplication by a real number different from 0

e.g.: the same plane is shared between those 3 equations
ex 1)

$$z = 0 \iff 5z = 0 \iff -10z = 0$$

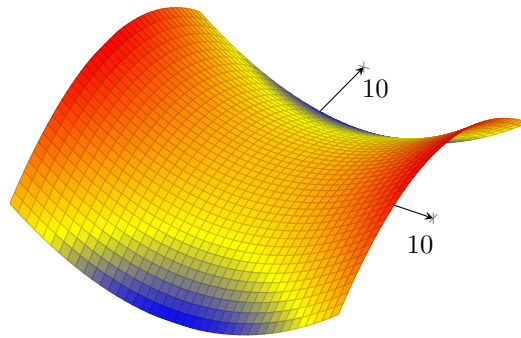
ex 2)

$$-x - \frac{1}{2}y - \frac{1}{3}z + 1 = 0 \iff 6x + 3y + 2z + 6 = 0$$

1 Functions in two variables x and y

Let us take $\pi : x^2 - y^2 = 0$ as example.

The plot would look like this:



1.1 Spheres