Geometry for CompSci
2017/18

Exercise class: weeks 13 & 14

C.2.1. Find the intersection points of the ellipsoid

$$\frac{x^2}{16} + \frac{y^2}{12} + \frac{z^2}{4} = 1$$

with the line $\frac{x-4}{2} = \frac{y+6}{-3} = \frac{z+2}{-2}$

Solution: The easiest way to determine this intersection is by writing the parametric equation for the line

$$\begin{cases} x = 2t+4 \\ y = -3t-6 \\ z = -2t-2 \end{cases}$$

All we have to do is determine t so that x, y, z also satisfy $\frac{x^2}{16} + \frac{y^2}{12} + \frac{z^2}{4} = 1$

This means that $\frac{(2t+4)^2}{16} + \frac{(-3t-6)^2}{12} + \frac{(-2t-2)^2}{4} = 1$

$$\Rightarrow \quad \frac{4t^2+16t+16}{16} + \frac{9t^2+36t+36}{12} + \frac{4t^2+8t+4}{4} = 1$$

②

$$\Rightarrow t^2\left(\frac{1}{4}+\frac{3}{4}+1\right)+t(1+3+2)+1+3+1=1$$

$$\Rightarrow 2t^2+6t+4=0 \Rightarrow t^2+3t+2=0 \Rightarrow$$

$$\Rightarrow t_{1,2}=\frac{-3\pm\sqrt{9-8}}{2} \Rightarrow t\in\{-2,-1\}$$

So the intersection points are $(0,0,2)$ and $(2,-3,0)$.

C.2.2. Find the rectilinear generatrices of the quadric

$$4x^2-9y^2=36z$$

which pass through the point $P(3\sqrt{2},2,1)$

<u>Lecture revision</u>:

There are some quadrics that (in spite of their curvy aspect) contain some families of lines.

They are, as follows: