$$C:\begin{cases} x = u \\ y = u^2 \\ z = u^3 \end{cases} \qquad P = (1,1,1) \leftrightarrow u = 1$$

Triedro principale

$u = 1$

$x' = 1 \qquad x'' = 0 \qquad\qquad x' = 1 \qquad x'' = 0$

$y' = 2u \qquad y'' = 2 \qquad\qquad y' = 2 \qquad y'' = 2$

$z' = 3u^2 \qquad z'' = 6u \qquad\qquad z' = 3 \qquad z'' = 6$

$$t: \frac{x-1}{1} = \frac{y-1}{2} = \frac{z-1}{3}$$

$$\Pi_o: \begin{vmatrix} (x-1) & (y-1) & (z-1) \\ 1 & 2 & 3 \\ 0 & 2 & 6 \end{vmatrix} = 0$$

$$6(x-1) - 6(y-1) + 2(z-1) = 0$$

$$6x - 6y + 2z - 2 = 0$$

$$\Pi_o: 3x - 3y + z - 1 = 0$$

$$\Pi_n: 1(x-1) + 2(y-1) + 3(z-1) = 0$$

$$x + 2y + 3z - 6 = 0$$

$$n: \begin{cases} 3x - 3y + z - 1 = 0 \\ x + 2y + 3z - 6 = 0 \end{cases} \qquad \begin{pmatrix} 3 & -3 & 1 \\ 1 & 2 & 3 \end{pmatrix}$$

$$(l, m, n) \sim \left(\begin{vmatrix} -3 & 1 \\ 2 & 3 \end{vmatrix}, - \begin{vmatrix} 3 & 1 \\ 1 & 3 \end{vmatrix}, \begin{vmatrix} 3 & -3 \\ 1 & 2 \end{vmatrix} \right) = (-11, -8, 9)$$

$$\Pi_r: -11(x-1) - 8(y-1) + 9(z-1) = 0$$

$$b: \begin{cases} x + 2y + 3z - 6 = 0 \\ -11(x-1) - 8(y-1) + 9(z-1) = 0 \end{cases}$$

$\varkappa$ = flessione $\quad \tau$ = torsione

$\vec{t}$ versore positivo della tangente

$\vec{n}$ " " " normale principale

$\vec{b}$ " " " binormale

$\vec{t}\,'$, $\vec{n}\,'$, $\vec{b}\,'$ i loro derivati primi

Formule di Frenet

$$\begin{pmatrix} \vec{t}\,' \\ \vec{n}\,' \\ \vec{b}\,' \end{pmatrix} = \begin{pmatrix} 0 & \varkappa & 0 \\ -\varkappa & 0 & -\tau \\ 0 & \tau & 0 \end{pmatrix} \begin{pmatrix} \vec{t} \\ \vec{n} \\ \vec{b} \end{pmatrix}$$

$$C:\begin{cases} x = u \\ y = u^2 \\ z = u^3 \end{cases}$$

$P \equiv (0,0,0) \longleftrightarrow u = 0$

	$u=0$
$x' = 1$	1
$y' = 2u$	0
$z' = 3u^2$	0
$x'' = 0$	0
$y'' = 2$	2
$z'' = 6u$	0

$$\begin{vmatrix} x & y & z \\ 1 & 0 & 0 \\ 0 & 2 & 0 \end{vmatrix} = 0$$

$2z = 0$

$\Pi_0 : z = 0$

$\mathcal{S} : x^2+y^2+z^2+ax+by+cz+d=0$

$F(x,y,z) =$

$\varphi(u) = u^2+u^4+u^6+au+bu^2+cu^3+d$

$\varphi'(u) = 2u+4u^3+6u^5+a+2bu+3cu^2$

$\varphi''(u) = 2+12u^2+30u^4+2b+6cu$

$u=0$

$d=0$

$a=0$

$2b+2=0$

$b=-1$

$c=k$

$x^2+y^2+z^2-y+kz=0$

$C \equiv \left(0, \frac{1}{2}, -\frac{k}{2}\right)$ impongo $\in \Pi_0 : k=0$

$C \equiv \left(0, \frac{1}{2}, 0\right)$

$R = \overline{PC} = \frac{1}{2}$ $\qquad \varkappa = 2$

$$\begin{cases} x^2+y^2+z^2-y=0 \\ z=0 \end{cases}$$

$\Sigma : x^3 - 2y^2 - 2z - 4x + 4 = 0$ $\quad P \equiv (2,0,2)$ $\quad$ Generica retta per P $\begin{cases} x = 2 + \ell u \\ y = m u \\ z = 2 + n u \end{cases}$ $\quad P \Leftrightarrow u = 0$

$$\Phi(u) = (2 + \ell u)^3 - 2m^2u^2 - 2(2 + nu) - 4(2 + \ell u) + 4$$

$$\Phi'(u) = 3\ell^3 u^3 - 4m^2 u + 12\ell^2 u - 2n + 8\ell$$

$$\Phi''(u) = 6\ell^3 u - 4m^2 + 12\ell^2$$

$\Phi(0) = 0$?

$$\begin{cases} \Phi'(0) = 0 \\ \Phi''(0) = 0 \end{cases} \qquad \begin{cases} -2n + 8\ell = 0 \\ -4m^2 + 12\ell^2 = 0 \end{cases}$$

$$\begin{cases} n = 4\ell \\ m^2 = 3\ell^2 \end{cases}$$

Scelgo $\ell = 1$

$$\begin{cases} \ell = 1 \\ n = 4 \\ m = \pm\sqrt{3} \end{cases}$$

$$\begin{cases} x = 2 + u \\ y = \pm\sqrt{3}\, u \\ z = 2 + 4u \end{cases}$$

$Q \equiv (0,1,1)$ $\qquad R \equiv (-2,0,2)$