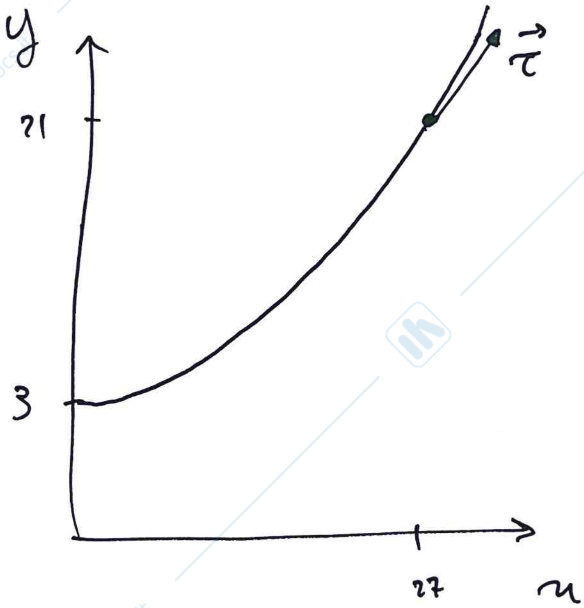
Legge di moto $\quad \vec{P}(t) = (9t)\vec{i} + (3+2t^2)\vec{j}$

la traiettoria si calcola come $y(x)$

$$\begin{cases} x = 9t \\ y = 3+2t^2 \end{cases} \qquad t = x/9 \qquad y = 3 + \frac{2}{81}x^2$$

versori $\vec{\tau}$ e $\vec{n}$ per $t = 3\,s$



ricordandosi che

$$\vec{v} = v\,\vec{\tau}$$

$$\vec{\tau} = \frac{\vec{v}}{v}$$

$$\vec{v} = \frac{d\vec{P}}{dt} = 9\vec{i} + 4t\,\vec{j}$$

$x(t=3) = 27\ m$

$y(t=3) = 21\ m$

$$\vec{v}(t=3s) = 9\vec{i} + 12\vec{j} \ [m/s]$$

$$v = \sqrt{v_x^2 + v_y^2} \qquad v(t=3s) = 15\ m/s$$

$$\vec{\tau}(t=3s) = \frac{9\vec{i} + 12\vec{j}}{15} = \frac{3}{5}\vec{i} + \frac{4}{5}\vec{j}$$

$\vec{n}$ si può calcolare dall'accelerazione normale

$$\vec{a}_n = a_n\vec{n} = \vec{a} - \vec{a}_t$$

$$\vec{a} = \frac{d\vec{v}}{dt} = 4\vec{j}$$

$$\vec{a}_t = (\vec{a} \cdot \vec{\tau})\,\vec{\tau} = \left((4\vec{j}) \cdot \left(\frac{3}{5}\vec{i} + \frac{4}{5}\vec{j} \right) \right) \vec{\tau}$$

$$= \frac{16}{5} \cdot \vec{\tau} = \frac{48}{25}\vec{i} + \frac{64}{25}\vec{j} \quad [m/s^2]$$

$$\vec{a}_n = \vec{a} - \vec{a}_t = 4\vec{j} - \frac{48}{25}\vec{i} - \frac{64}{25}\vec{j}$$

$$= -\frac{48}{25}\vec{i} + \frac{36}{25}\vec{j} \quad [m/s^2]$$

$$\vec{n} = \frac{\vec{a}_n}{a_n} = \frac{-48/25\,\vec{i} + 36/25\,\vec{j}}{12/5} = -\frac{4}{5}\vec{i} + \frac{3}{5}\vec{j}$$