Exo5.

$y = x^2$, $x = 2t \Rightarrow y = 4t^2$

La vitesse :

$$\vec{V} = \begin{cases} V_x = \frac{dx}{dt} = 2 \\ V_y = \frac{dy}{dt} = 8t \end{cases}$$

$|\vec{V}| = \sqrt{4 + 64t^2}$ m/s

L'accélération :

$$\vec{a} = \begin{cases} a_x = 0 \\ a_y = 8 \end{cases} \Rightarrow |\vec{a}| = 8 \text{ m/s}^2$$

- L'accélération normale :

$$a_T = \frac{d|\vec{v}|}{dt} = \frac{64 \times 2t}{2\sqrt{4+64t^2}}$$

$$= \frac{64t}{\sqrt{4+64t^2}} \text{ m/s}$$

$$a_N = \sqrt{a^2 - a_T^2}$$

$$= \sqrt{64 - \frac{(64t)^2}{4+64t^2}}$$

$$a_N = \frac{8}{\sqrt{1+16t^2}} \text{ m/s}$$

Le rayon de courbure

$$R = \frac{v^2}{a_N} = \frac{4+64t^2}{\frac{8}{\sqrt{1+16t^2}}}$$

$$= \frac{4(1+16t^2) \times \sqrt{1+16t^2}}{8}$$

$$R = \frac{(1+16t^2)^{\frac{3}{2}}}{2} \text{ m}$$