3 méthodes :

* Limite de la corde

$$\lim_{t \to t0} \frac{\mathrm{y}(t) - \mathrm{y}(t0)}{\mathrm{x}(t) - \mathrm{x}(t0)}$$

* Limite de la tangente

$$\lim_{t \to t0} \frac{\mathrm{D}(y)(t)}{\mathrm{D}(x)(t)}$$

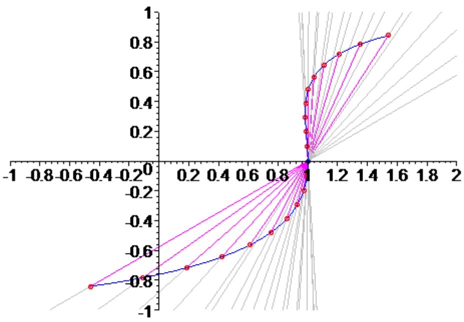
* Développement limité

$$\mathrm{M}(t) = \mathrm{M}(t0) + (t - t0)\left(\frac{dM}{dt}\right) + \frac{1}{2}(t - t0)^2\left(\frac{d^2 M}{dt^2}\right) + \frac{1}{6}(t - t0)^3\left(\frac{d^3 M}{dt^3}\right) + (t - t0)^3\,\varepsilon(t - t0)$$

Visualisation des cordes

$$x := t \to t^3 + \cos(t)$$

$$y := \sin$$



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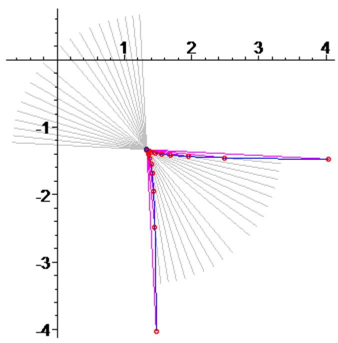
$$x := t \to \frac{1}{3}\frac{(t + 2)^2}{t + 1}$$

$$y := t \to \frac{1}{3}\frac{(t - 2)^2}{t - 1}$$



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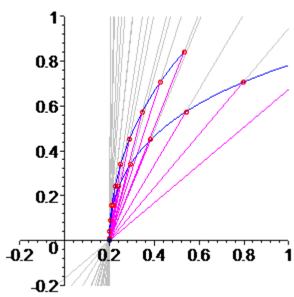
$$x := t \to .2 + \frac{t^4}{2 - t}$$

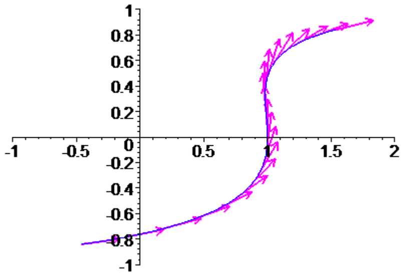
$$y := t \to t \sin(t)$$



Visualisation des tangentes

$$x := t \to t^3 + \cos(t)$$

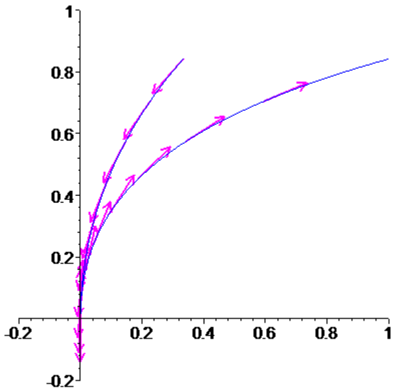
$$y := \sin$$



****

$$x := t \to \frac{t^4}{2-t}$$

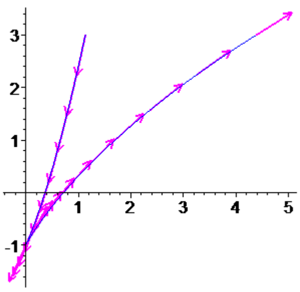
$$y := t \to t\sin(t)$$



****

$$x := t \to \mathrm{e}^{(t-1)} - t$$

$$y := t \to t^2 - 2\,t$$

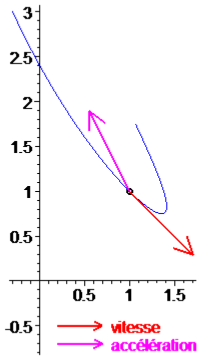


Utilisation des développements liités

$$x := t \to \sin(t) + \cos(t)$$

$$y := t \to 1 - t + t^2$$

$$\mathrm{M}(u) = \begin{bmatrix} 1 \\ 1 \end{bmatrix} + u \begin{bmatrix} 1 \\ -1 \end{bmatrix} + u^2 \begin{bmatrix} \frac{-1}{2} \\ 1 \end{bmatrix} + u^2\,\varepsilon(u)$$



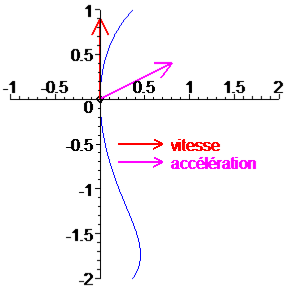
point ordinaire

****

$$x := t \rightarrow \frac{\sin(t^2)}{1-t}$$

$$y := t \rightarrow 1 + 2\,t - \cos(t)$$

$$\mathrm{M}(u) = \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u \begin{bmatrix} 0 \\ 2 \end{bmatrix} + u^2 \begin{bmatrix} 1 \\ \frac{1}{2} \end{bmatrix} + u^2\,\varepsilon(u)$$



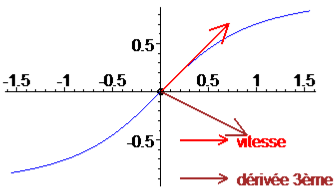
point ordinaire à tangente verticale

****

$$x := \tan$$

$$y := \sin$$

$$\mathrm{M}(u) = \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u \begin{bmatrix} 1 \\ 1 \end{bmatrix} + u^2 \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u^3 \begin{bmatrix} \frac{1}{3} \\ \frac{-1}{6} \end{bmatrix} + u^3\,\varepsilon(u)$$



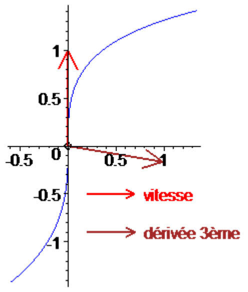
point d'inflexion

****

$$x := t \rightarrow t^4 + 2\,t^3$$

$$y := t \rightarrow 2\,\sin(t)$$

$$\mathrm{M}(u) = \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u \begin{bmatrix} 0 \\ 2 \end{bmatrix} + u^2 \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u^3 \begin{bmatrix} 2 \\ \frac{-1}{3} \end{bmatrix} + u^3\,\varepsilon(u)$$



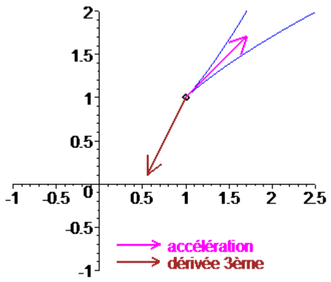
point d'inflexion à tangente verticale

****

$$x := t \to t^2 + 2\,\frac{1}{t} - 2$$

$$y := t \to 2\,t + \frac{1}{t^2} - 2$$

$$\mathrm{M}(u+1) = \begin{bmatrix} 1 \\ 1 \end{bmatrix} + u \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u^2 \begin{bmatrix} 3 \\ 3 \end{bmatrix} + u^3 \begin{bmatrix} -2 \\ -4 \end{bmatrix} + u^3\,\varepsilon(u)$$



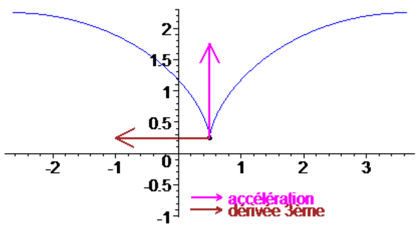
rebroussement 1ere espèce

****

$$x := t \to \frac{1}{2} + \sin(t) - t$$

$$y := t \to \frac{5}{4} - \cos(t)$$

$$\mathrm{M}(u) = \begin{bmatrix} \frac{1}{2} \\ \frac{1}{4} \end{bmatrix} + u \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u^2 \begin{bmatrix} 0 \\ \frac{1}{2} \end{bmatrix} + u^3 \begin{bmatrix} \frac{-1}{6} \\ 0 \end{bmatrix} + u^3\,\varepsilon(u)$$



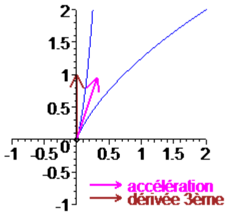
rebroussement 1ere espèce tangente verticale

****

$$x := t \to (t+1)^2$$

$$y := t \to -2\,t + \frac{1}{t^2} - 3$$

$$\mathrm{M}(u-1) = \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u^2 \begin{bmatrix} 1 \\ 3 \end{bmatrix} + u^3 \begin{bmatrix} 0 \\ 4 \end{bmatrix} + u^3\,\varepsilon(u)$$



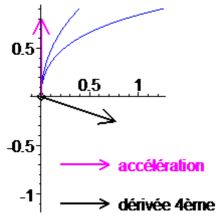
rebroussement 1ere espèce

****

$$x := t \to \frac{t^4}{2-t}$$

$$y := t \to t\sin(t)$$

$$\mathrm{M}(u) = \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u^2 \begin{bmatrix} 0 \\ 1 \end{bmatrix} + u^3 \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u^4 \begin{bmatrix} \frac{1}{2} \\ \frac{-1}{6} \end{bmatrix} + u^4\,\varepsilon(u)$$



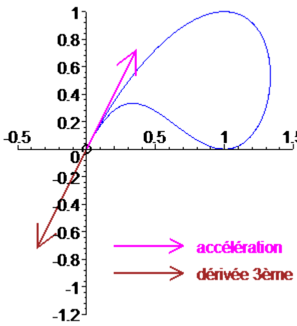
rebroussement 2eme espèce

****

$$x := t \to 2\,\frac{\sin(t)^2}{2+\sin(2\,t)}$$

$$y := t \to \frac{\sin(2\,t)^2}{2+\sin(2\,t)}$$

$$\mathrm{M}(u) = \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u \begin{bmatrix} 0 \\ 0 \end{bmatrix} + u^2 \begin{bmatrix} 1 \\ 2 \end{bmatrix} + u^3 \begin{bmatrix} -1 \\ -2 \end{bmatrix} + u^4 \begin{bmatrix} \frac{2}{3} \\ \frac{-2}{3} \end{bmatrix} + u^4\,\varepsilon(u)$$



derivee 3ème colinéaire à dérivée seconde

Il faut un DL au 4ème ordre