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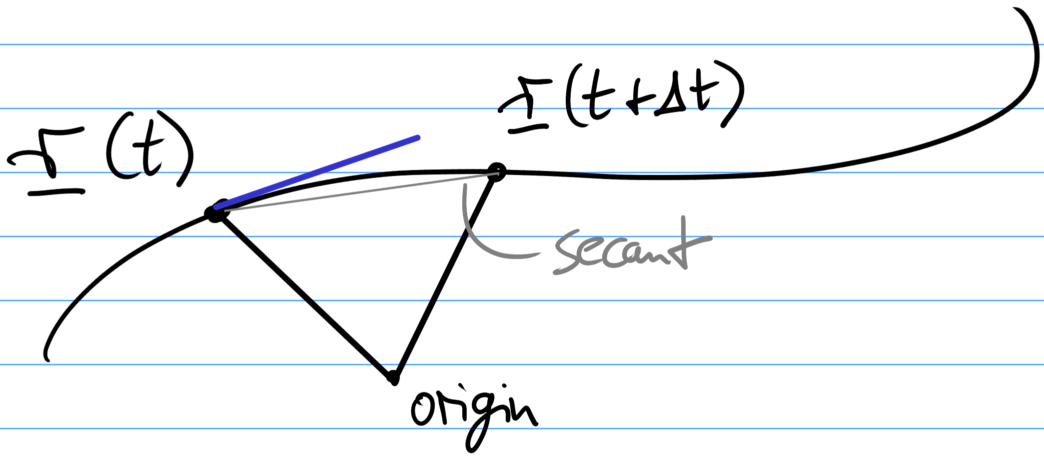
Repetition: Streamlines tangential to Velocity vectors. ✓

Let's start the other way round:
We have a path of a fluid element:



$\lim_{\Delta t \to 0} \Rightarrow$ secant $\rightarrow$ tangent

$$\lim_{\Delta t \to 0} \frac{\underline{r}(t+\Delta t) - \underline{r}(t)}{\Delta t} = \lim_{\Delta t \to 0} \begin{pmatrix} \frac{x(t+\Delta t) - x(t)}{\Delta t} \\ \frac{y(t+\Delta t) - y(t)}{\Delta t} \\ \frac{z(t+\Delta t) - z(t)}{\Delta t} \end{pmatrix}$$

$$= \dot{\underline{r}}(t) = \underline{V}(t) = \begin{pmatrix} \dot{x}(t) \\ \dot{y}(t) \\ \dot{z}(t) \end{pmatrix} = \begin{pmatrix} u(t) \\ v(t) \\ w(t) \end{pmatrix}$$

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$$[p] = Pa = \frac{N}{m^2} = \frac{kg \cdot \frac{m}{s^2}}{m^2} = \frac{kg}{m\, s^2}$$

$$\left[\rho \frac{v^2}{2}\right] = \frac{kg}{m^3} \cdot \left(\frac{m}{s}\right)^2 = \frac{kg}{m\, s^2}$$

$$[\rho g z] = \frac{kg}{m^3} \frac{m}{s^2} m = \frac{kg}{m s^2} \quad \checkmark$$

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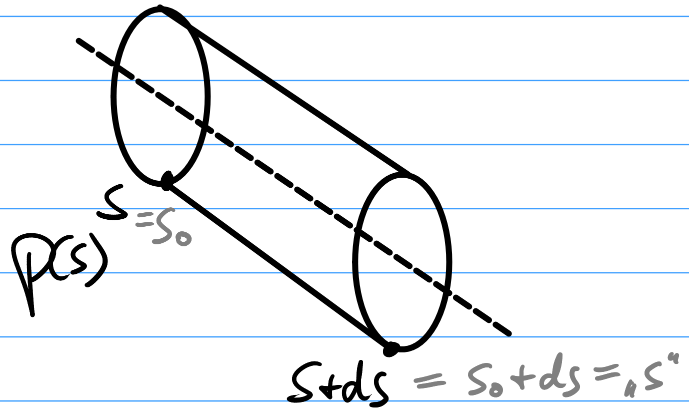
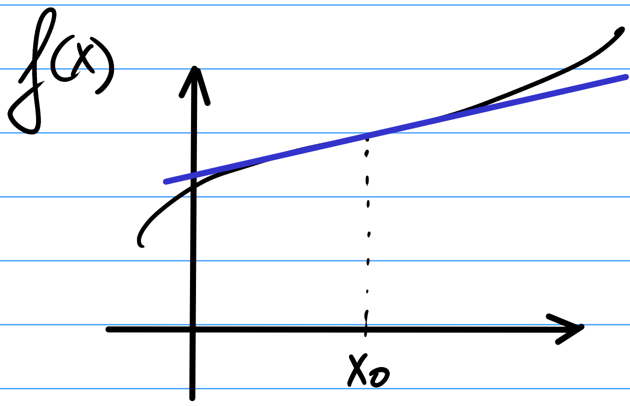
fluid element



$p(s+ds) = ? \approx p(s_0) + \frac{dp(s_0)}{ds} ds$



$g(x) = f(x_0) + f'(x_0)(x-x_0)$

Tangente

$\Rightarrow p(s)$

$g(s) = p(s_0) + p'(s_0)(s-s_0)$

Approximation of $p(s)$ at position s_0

Change of names of symbols

s_0 is „beginning of fluid element"

s is „other position" $= s_0+ds$