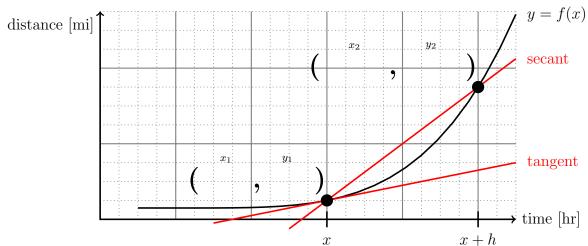
## The Limit Definition of Derivative

Suppose the distance a train has traveled is a function of time y = f(x).

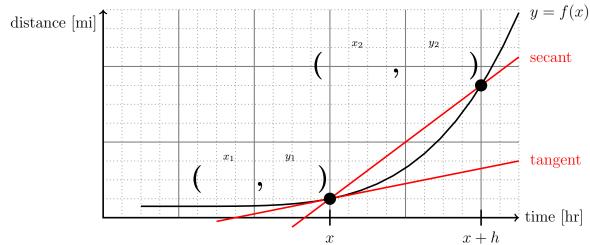


average velocity over 
$$[x,x+h]$$
 =  $\begin{pmatrix} \text{average} \\ \text{rate of} \\ \text{change} \\ \text{over} \\ [x,x+h] \end{pmatrix}$  =  $\begin{pmatrix} \text{slope of} \\ \text{secant} \\ \text{secant} \\ \text{between} \\ x,x+h \end{pmatrix}$  =  $\begin{pmatrix} \Delta y \\ \Delta x \end{pmatrix}$  =  $\begin{pmatrix} y_2 - y_1 \\ x_2 - x_1 \end{pmatrix}$  =  $\begin{pmatrix} \text{definition of difference} \\ \text{quotient} \end{pmatrix}$ 

velocity at 
$$x$$
 =  $\frac{\text{rate of change}}{\text{at } x}$  =  $\frac{\text{slope of tangent}}{\text{at } x}$  =  $\lim_{h \to \infty}$  = definition of derivative  $f'(x)$ 

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