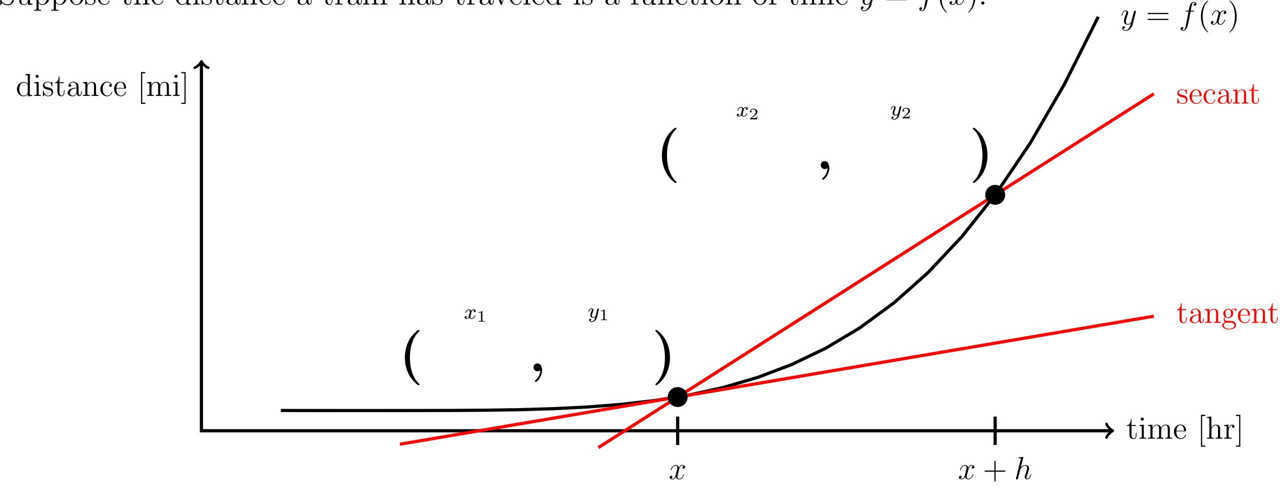
The Limit Definition of Derivative

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



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

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

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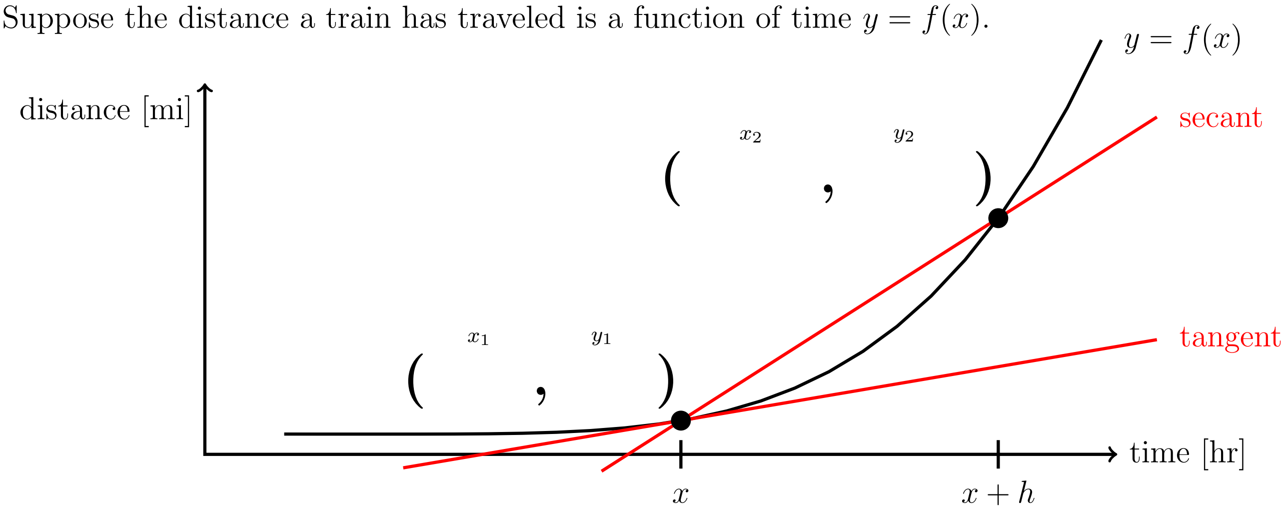

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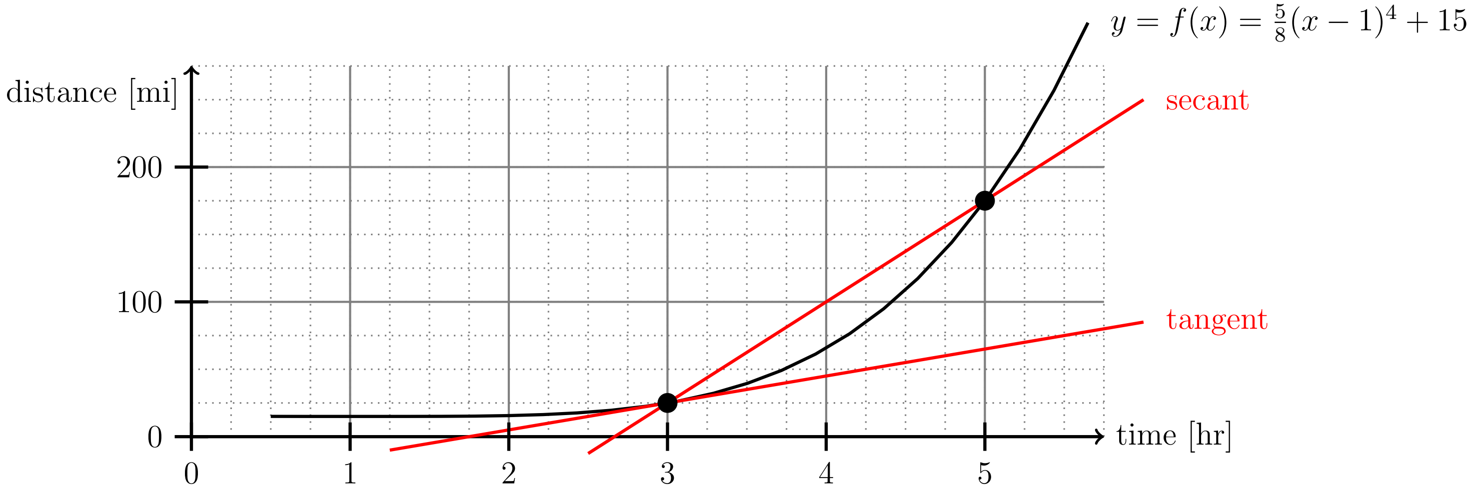
Exercise 1. Use the definition of difference quotient to find the slope of the **secant** line through $y = f(x) = \frac{5}{8}(x-1)^4 + 15$ between x and $x+h$.

Exercise 2. Use the definition of difference quotient to find the slope of the **tangent** line to $y = f(x) = \frac{5}{8}(x-1)^4 + 15$ at x.



Exercise 3. Use the **diagram** to estimate the slope of the **secant** line to $y = f(x) = \frac{5}{8}(x-1)^4 + 15$ between 3 and 5.

Exercise 4. Use your answer to Exercise 2 above to estimate the slope of the **tangent** line to $y = f(x) = \frac{5}{8}(x-1)^4 + 15$ at 3.

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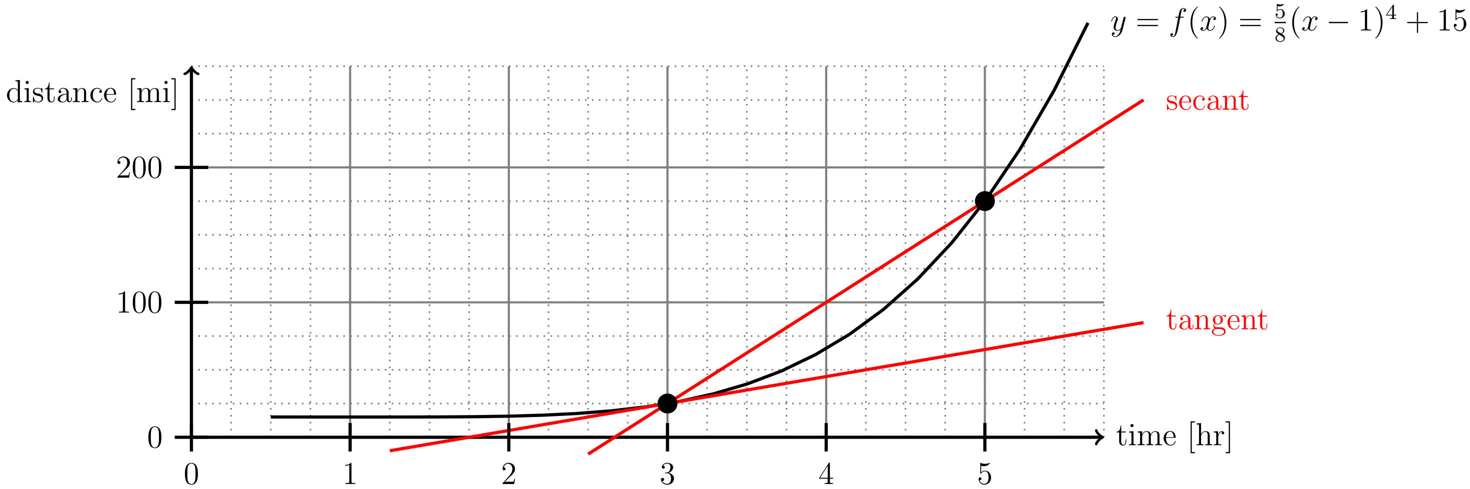

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