THE DERIVATIVES

DIFFERENTIAL CALCULUS

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TOPIC OUTLINE

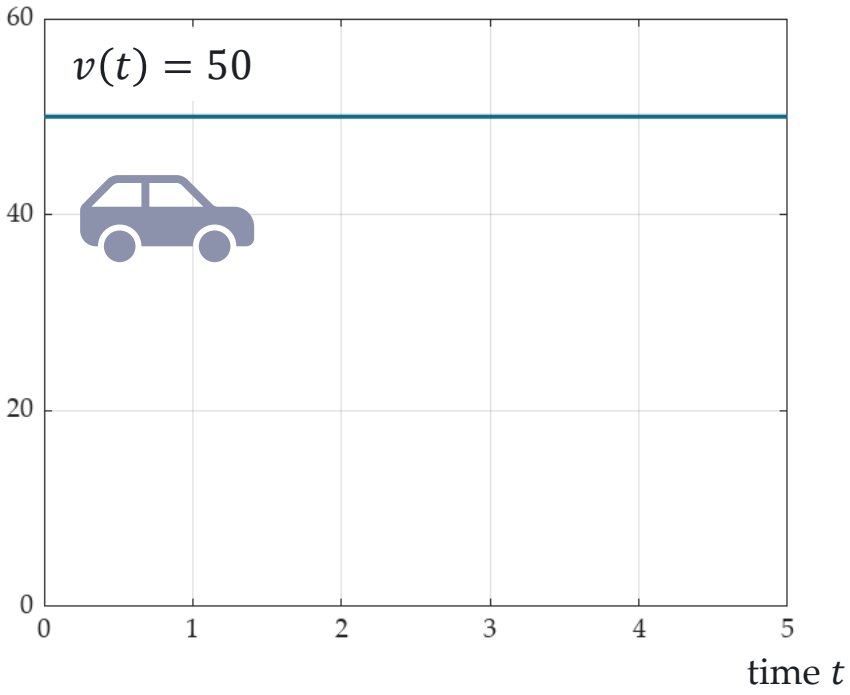
The Slope of a Line

The Derivatives

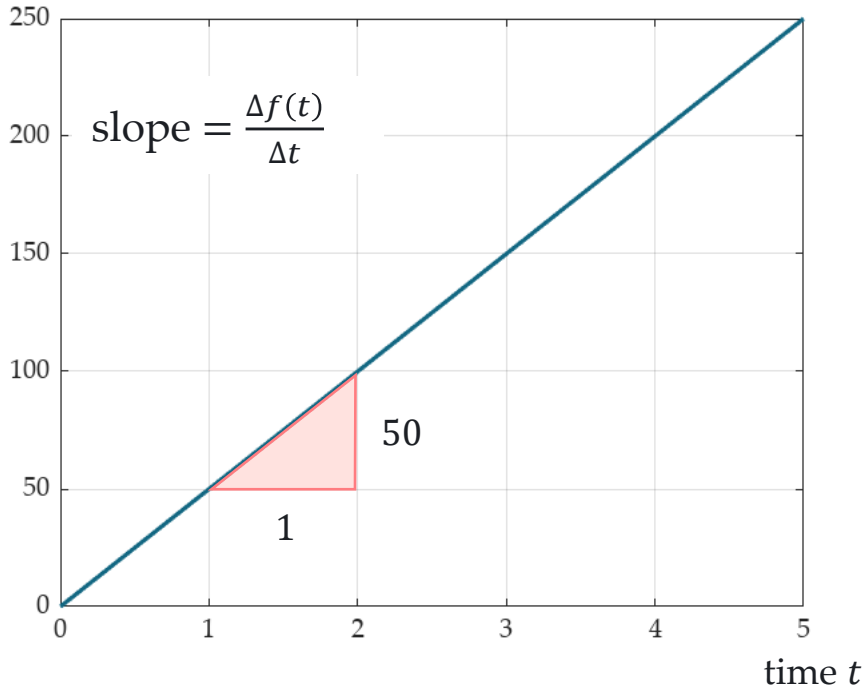
THE SLOPE OF A LINE

CONSTANT VELOCITY

velocity $v(t)$



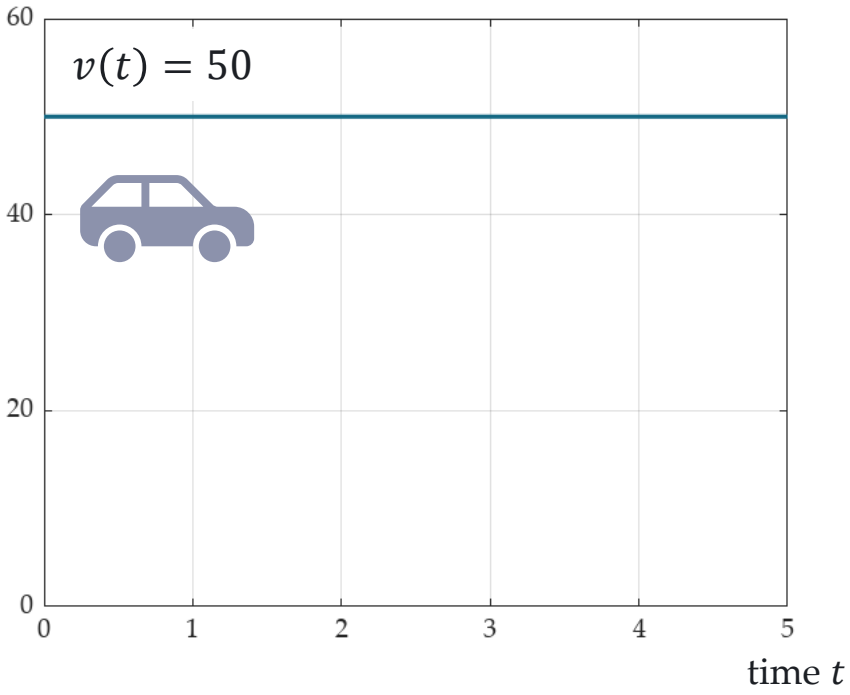
distance $f(t)$



Linearly increasing distance
$f(t) = 50t$

CONSTANT VELOCITY

velocity $v(t)$



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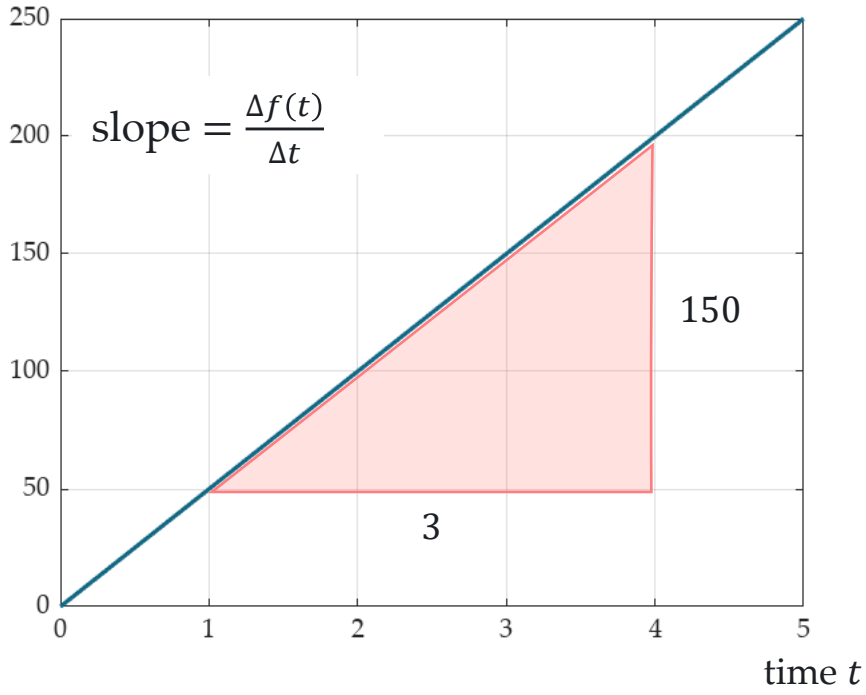
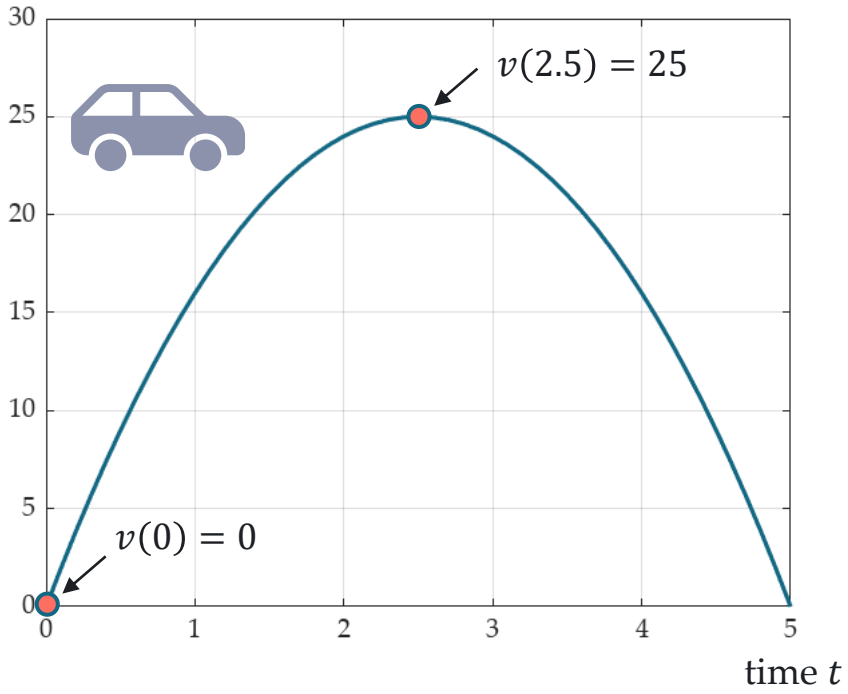


Linearly increasing distance

$f(t) = 50t$

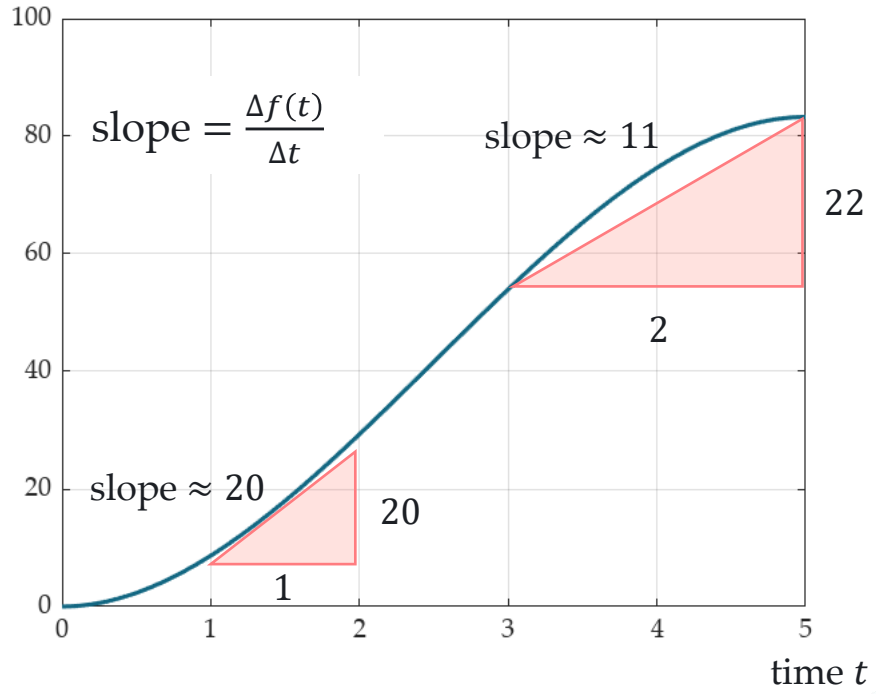
INSTANTENEOUS VELOCITY

velocity $v(t)$



Real-life problems are nonlinear

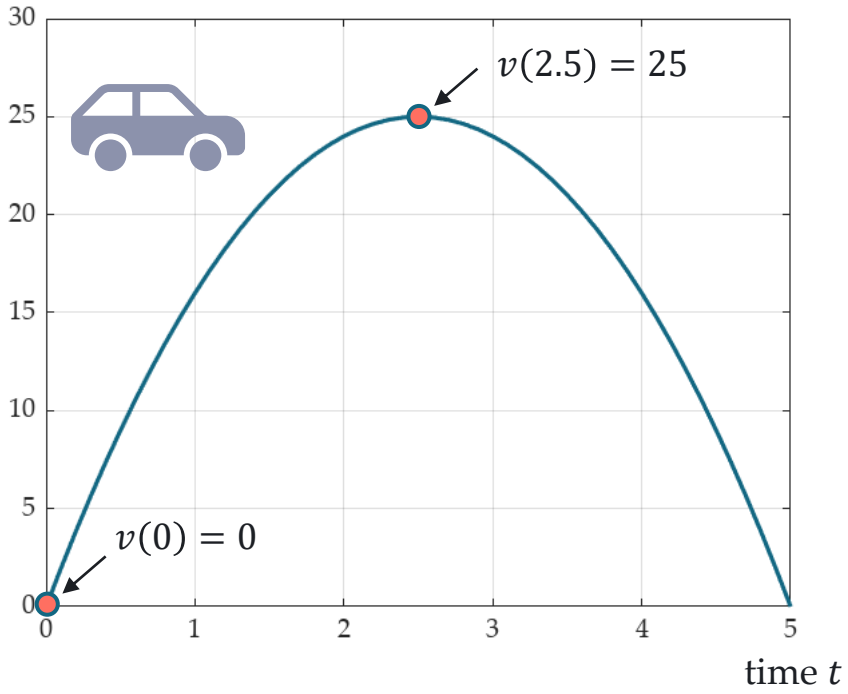
distance $f(t)$



Slopes (velocity) are not equal

INSTANTENEOUS VELOCITY

velocity $v(t)$



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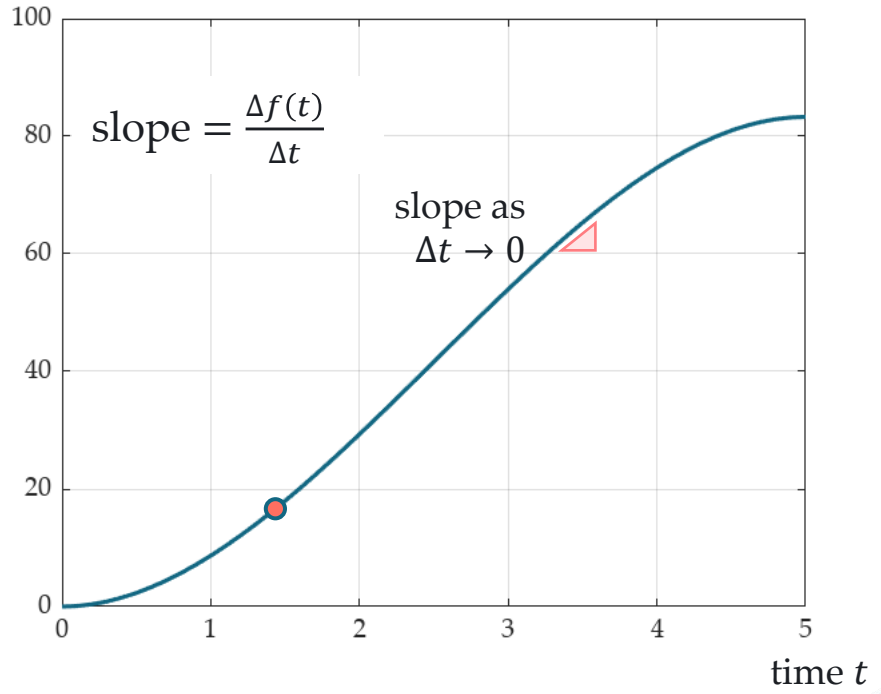


Let Δt approaches zero

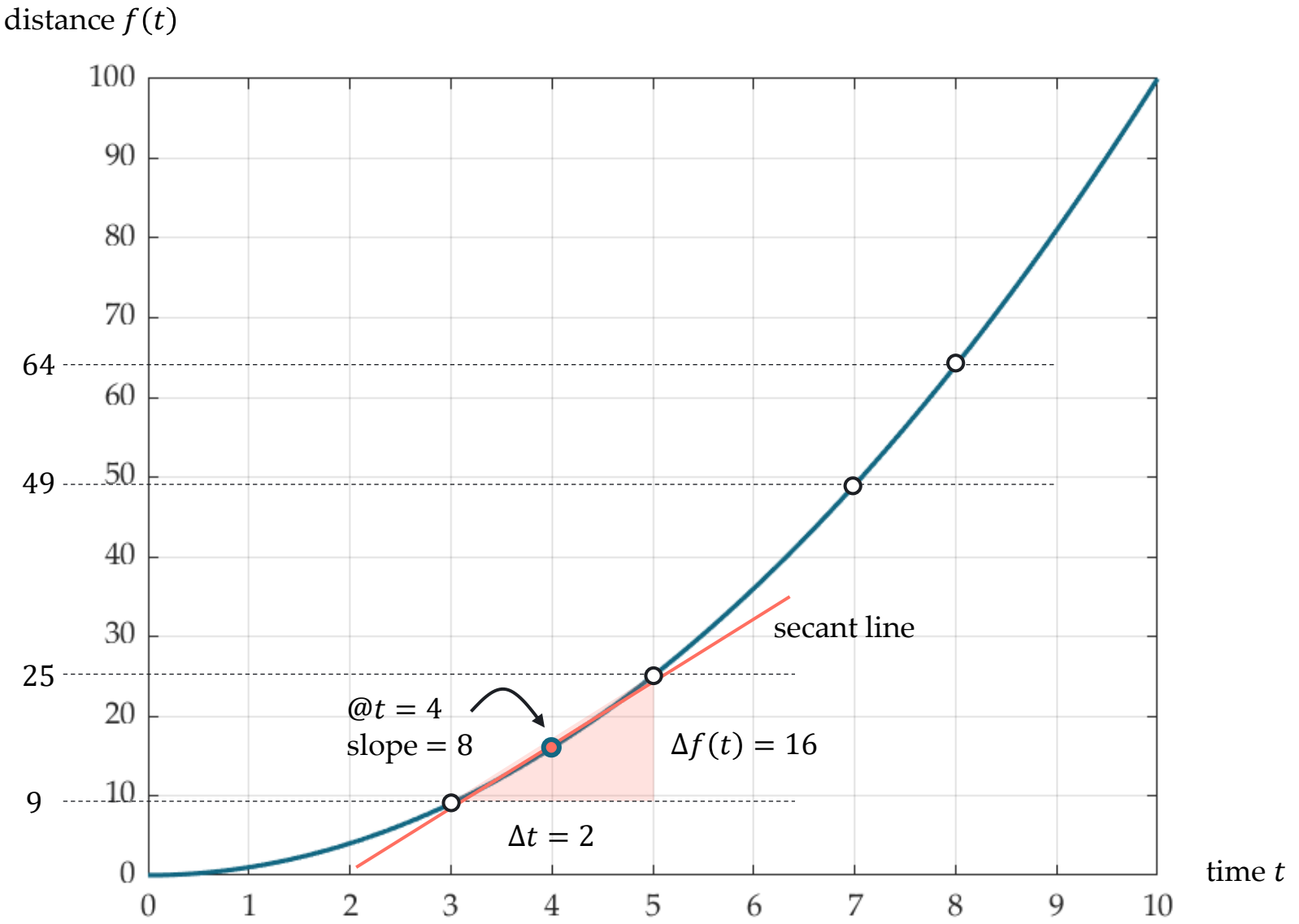
VELOCITY AT AN INSTANT

distance

$$f(t) = t^2$$

average velocity

$$\frac{\Delta f(t)}{\Delta t} = 2t$$



VELOCITY AT AN INSTANT

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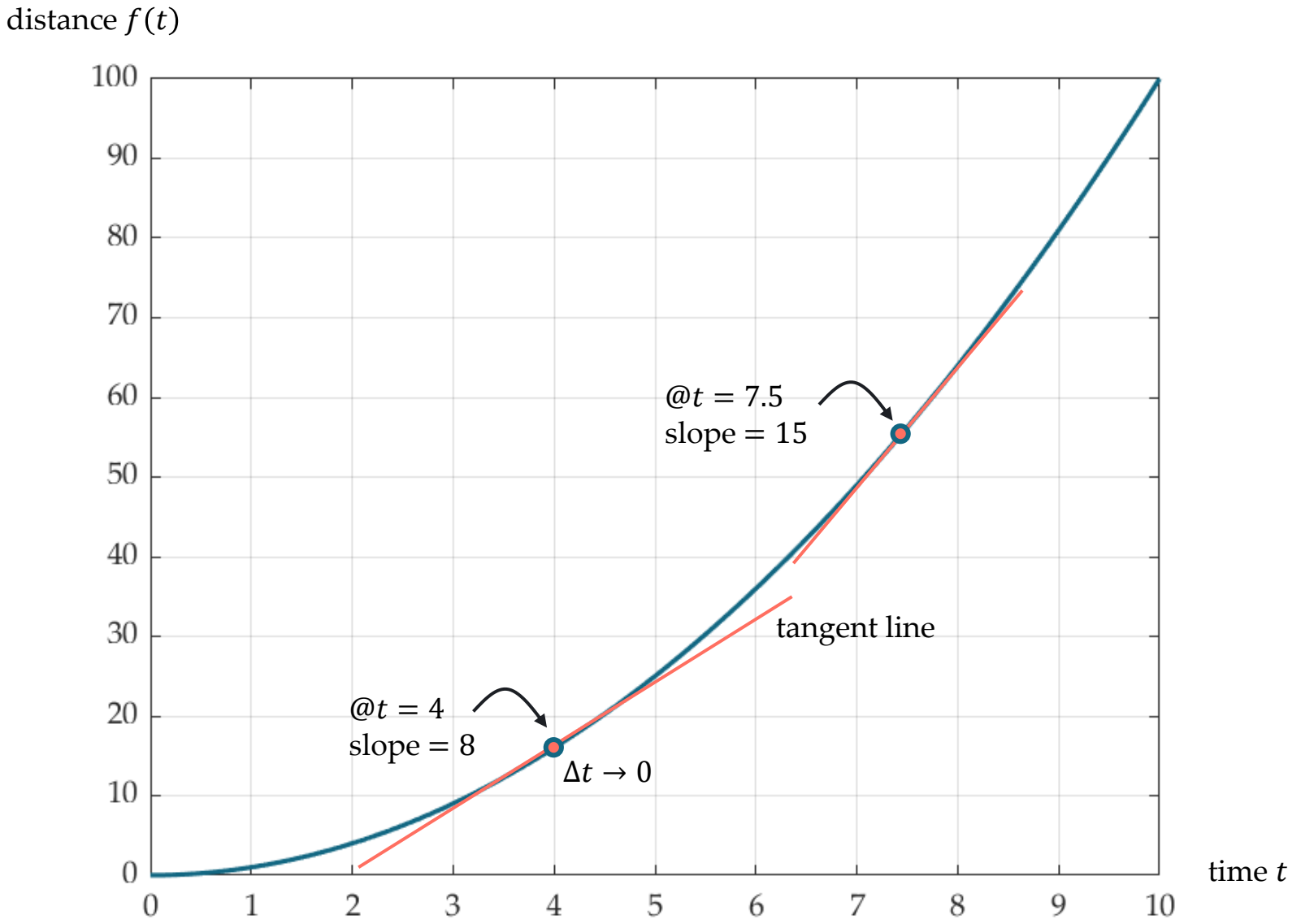
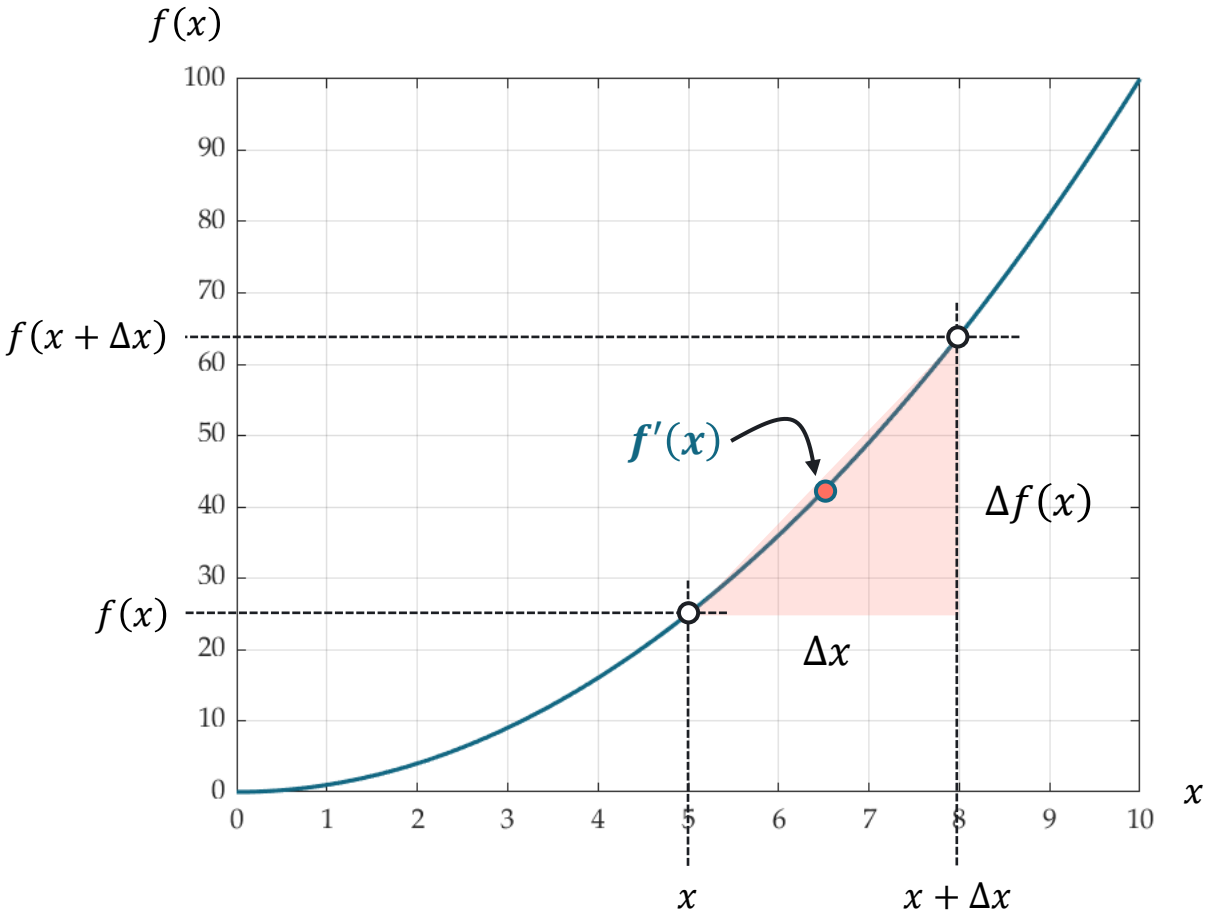


THE DERIVATIVES

DERIVATIVE OF A FUNCTION



Difference Quotient

$$\frac{\Delta f(x)}{\Delta x} = \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

The Derivative of $f(x)$

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

EXERCISE

Find the derivative of the function

$$f(x) = 2x$$

(use the difference quotient formula).

Solution

EXERCISE

Find the derivative of the function

$$f(x) = 2x^2$$

(use the difference quotient formula).

Solution

EXERCISE

Find the derivative of the function

$$f(x) = x^3 - x$$

(use the difference quotient formula).

Solution

EXERCISE

Find the derivative of the function

$$f(x) = x^2 - 8x + 9$$

(use the difference quotient formula).

Solution

EXERCISE

Find the derivative of the function

$$f(x) = x^{-2}$$

(use the difference quotient formula).

Solution

LABORATORY