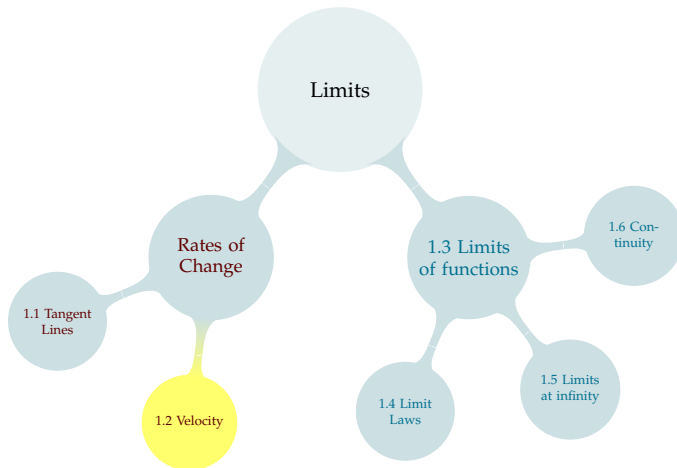
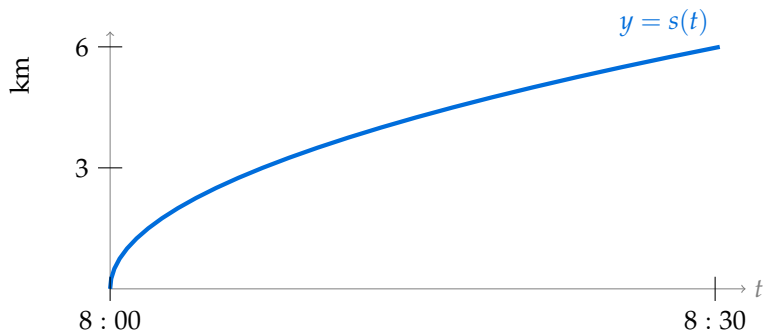
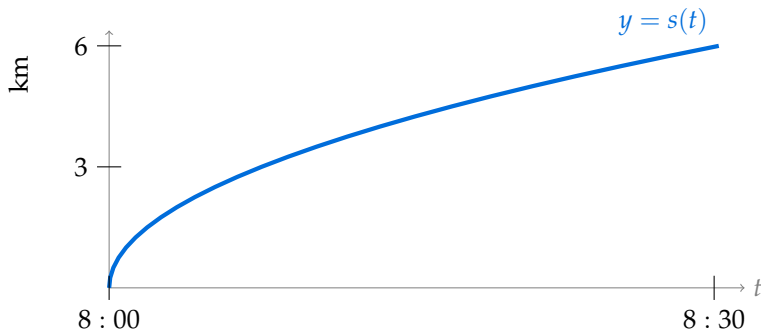


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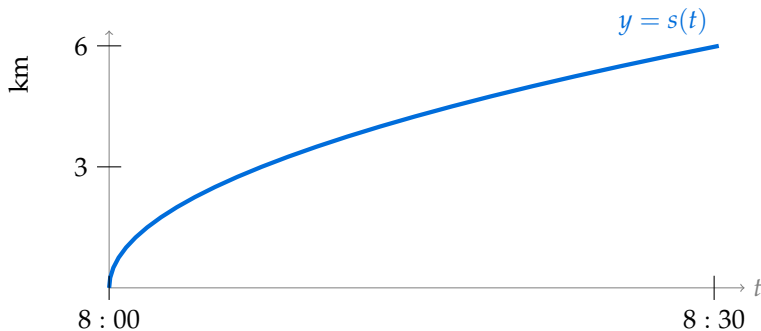






It took  $\frac{1}{2}$  hour to bike 6 km. 12 kph represents the:

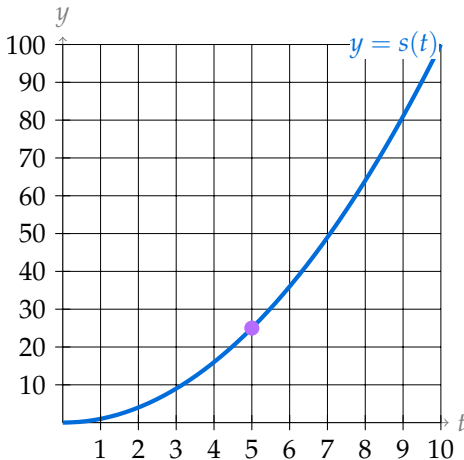
- A. secant line to  $y = s(t)$  from  $t = 8:00$  to  $t = 8:30$
- B. slope of the secant line to  $y = s(t)$  from  $t = 8:00$  to  $t = 8:30$
- C. tangent line to  $y = s(t)$  at  $t = 8:30$
- D. slope of the tangent line to  $y = s(t)$  at  $t = 8:30$



At 8:25, the speedometer on my bike reads 5 kph. 5 kph represents the:

- A. secant line to  $y = s(t)$  from  $t = 8 : 00$  to  $t = 8 : 25$
- B. slope of the secant line to  $y = s(t)$  from  $t = 8 : 00$  to  $t = 8 : 25$
- C. tangent line to  $y = s(t)$  at  $t = 8 : 25$
- D. slope of the tangent line to  $y = s(t)$  at  $t = 8 : 25$

Suppose the distance from the ground  $s$  (in meters) of a helium-filled balloon at time  $t$  over a 10-second interval is given by  $s(t) = t^2$ . Try to estimate how fast the balloon is rising when  $t = 5$ .



Let's look for an algebraic way of determining the velocity of the balloon when  $t = 5$ .

# OUR FIRST LIMIT

Average Velocity,  $t = 5$  to  $t = 5 + h$ :

$$\begin{aligned}\frac{\Delta s}{\Delta t} &= \frac{s(5+h) - s(5)}{h} \\ &= \frac{(5+h)^2 - 5^2}{h} \\ &= 10 + h \quad \text{when } h \neq 0\end{aligned}$$

When  $h$  is very small,

$$\text{Vel} \approx 10$$

# LIMIT NOTATION

We write:

$$\lim_{h \rightarrow 0} (10 + h) = 10$$

We say: “The limit as  $h$  goes to 0 of  $(10 + h)$  is 10.”

It means: As  $h$  gets extremely close to 0,  $(10 + h)$  gets extremely close to 10.