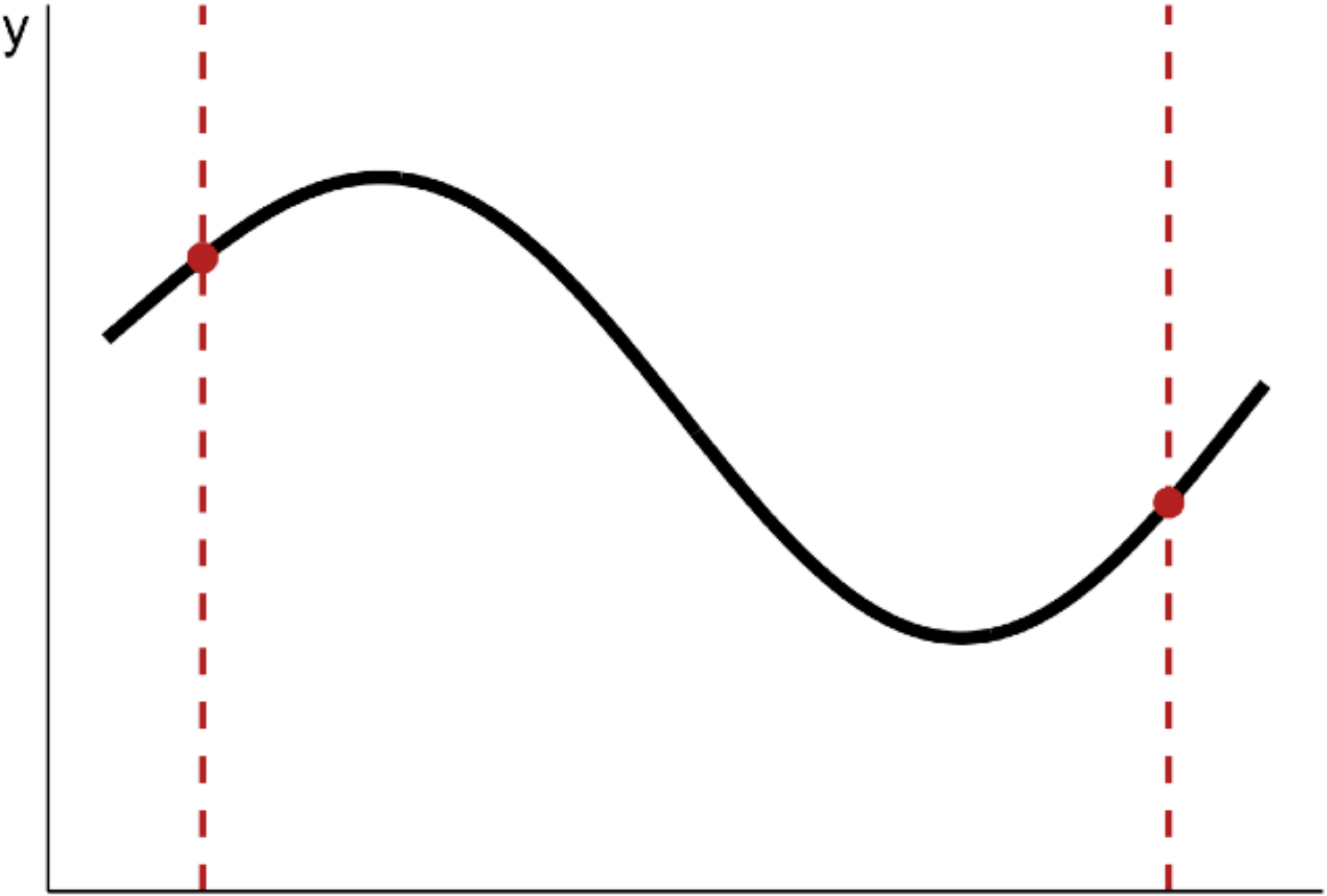
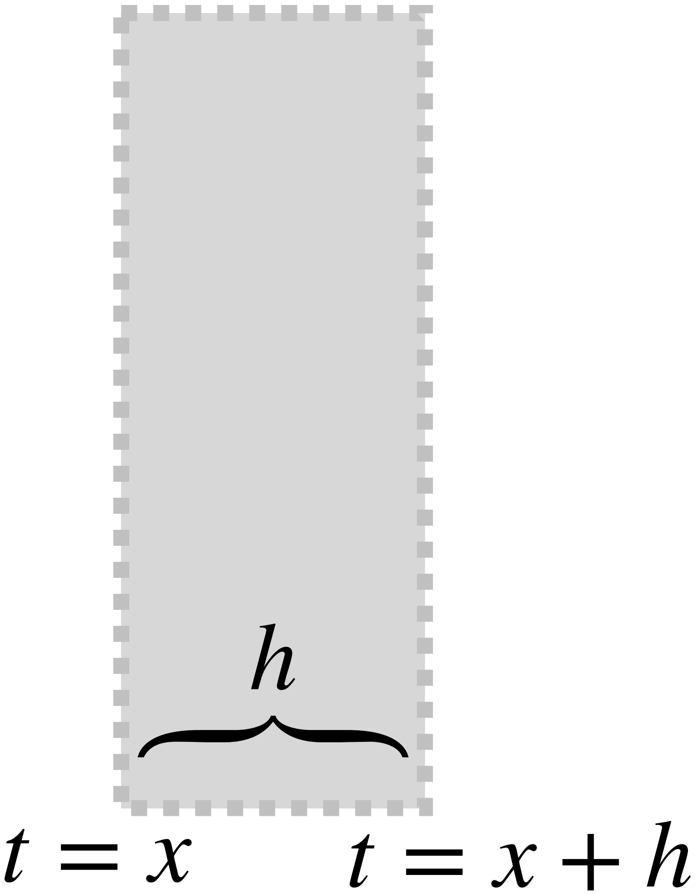
area under the curve


y


h
t = x
t = x + h

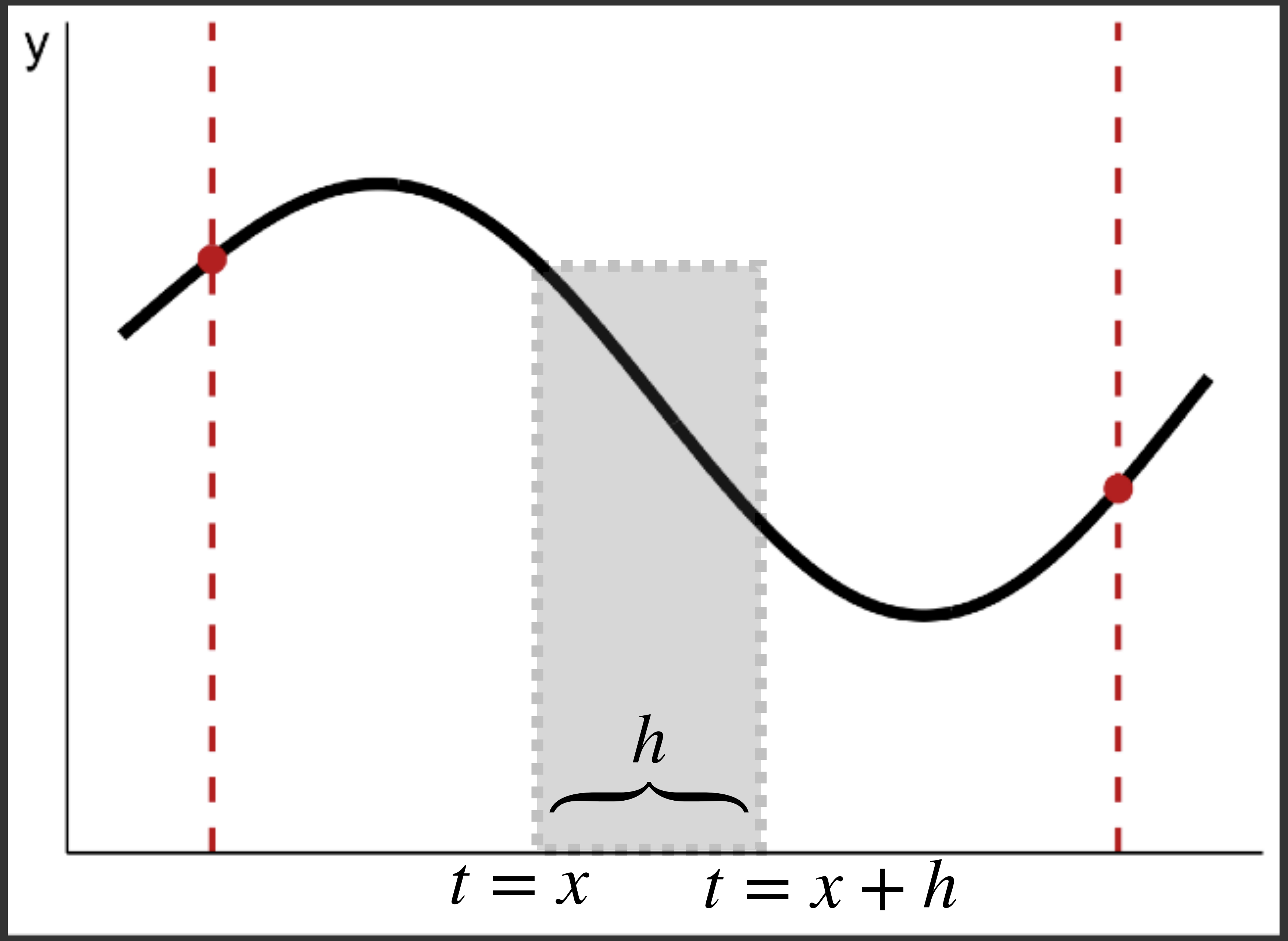
antiderivative

area under the curve

- The difference $A(x+h) - A(x)$ is the area between $t = x$ and $t = x + h$
- The area is rectangular (if h is small) with height $f(x)$ and base h so area is $\approx f(x) \cdot h$

$$A(x+h) - A(x) \approx f(x) \cdot h \implies \frac{A(x+h) - A(x)}{h} \approx f(x)$$

$$\frac{A(x+h) - A(x)}{h} \to f(x) \text{ as } h \to 0$$



By the definition of the derivative, we have $A'(x) = f(x)$ and $A(x)$ as the antiderivative of $f(x)$

note: if $A(x)$ is an antiderivative $f(x)$ then $A(x) + C$ for any constant C is also an antiderivative of $f(x)$

definite and indefinite integral