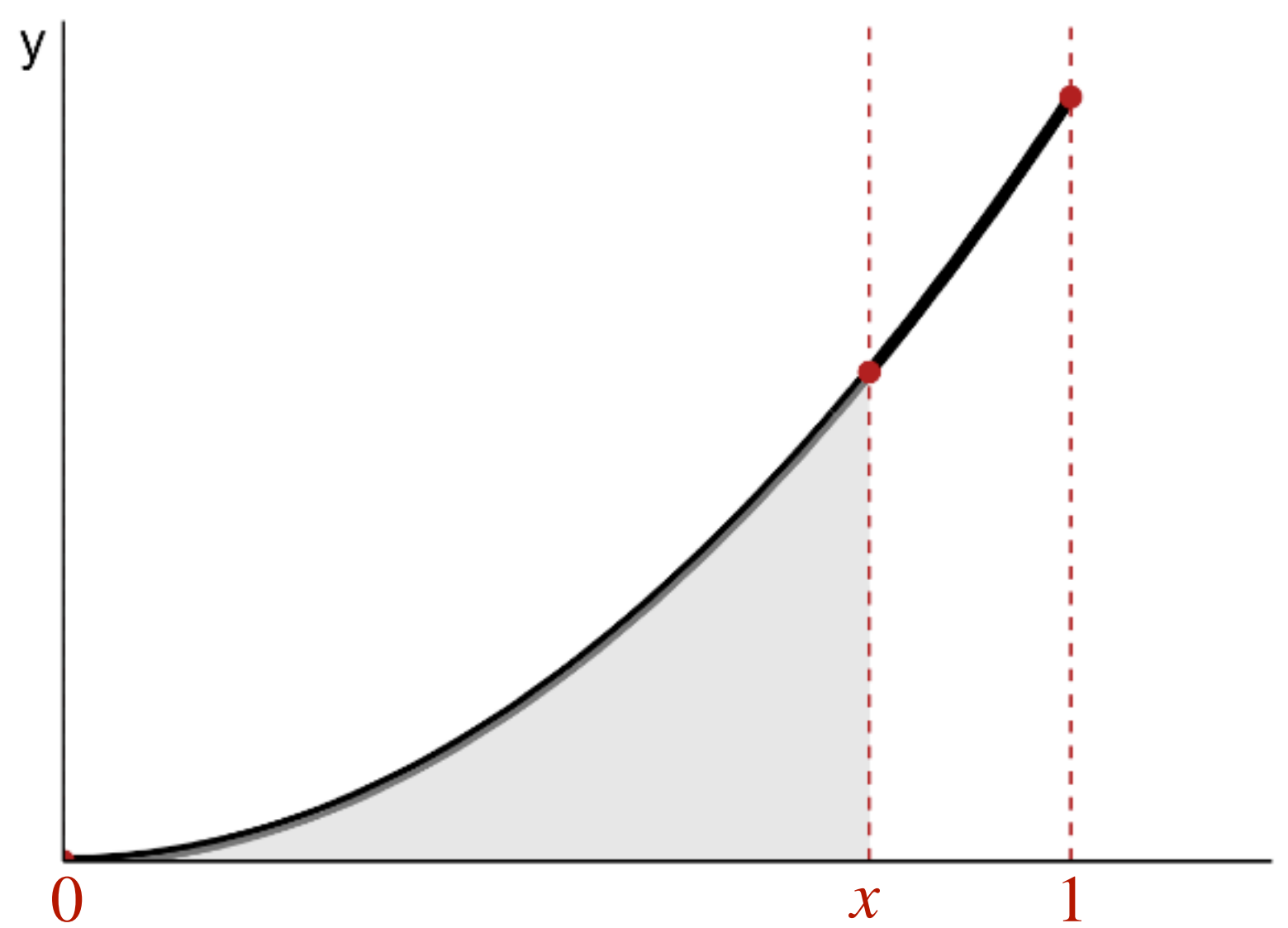




definite and indefinite integrals



example















**$\int$**  *indefinite  
integral*

**$\int_a^b$**  *definite integral*

# definite and indefinite integral

## example

Consider  $f(t) = t^2$  and let's calculate the area under  $y = t^2$  between 0 and 1.

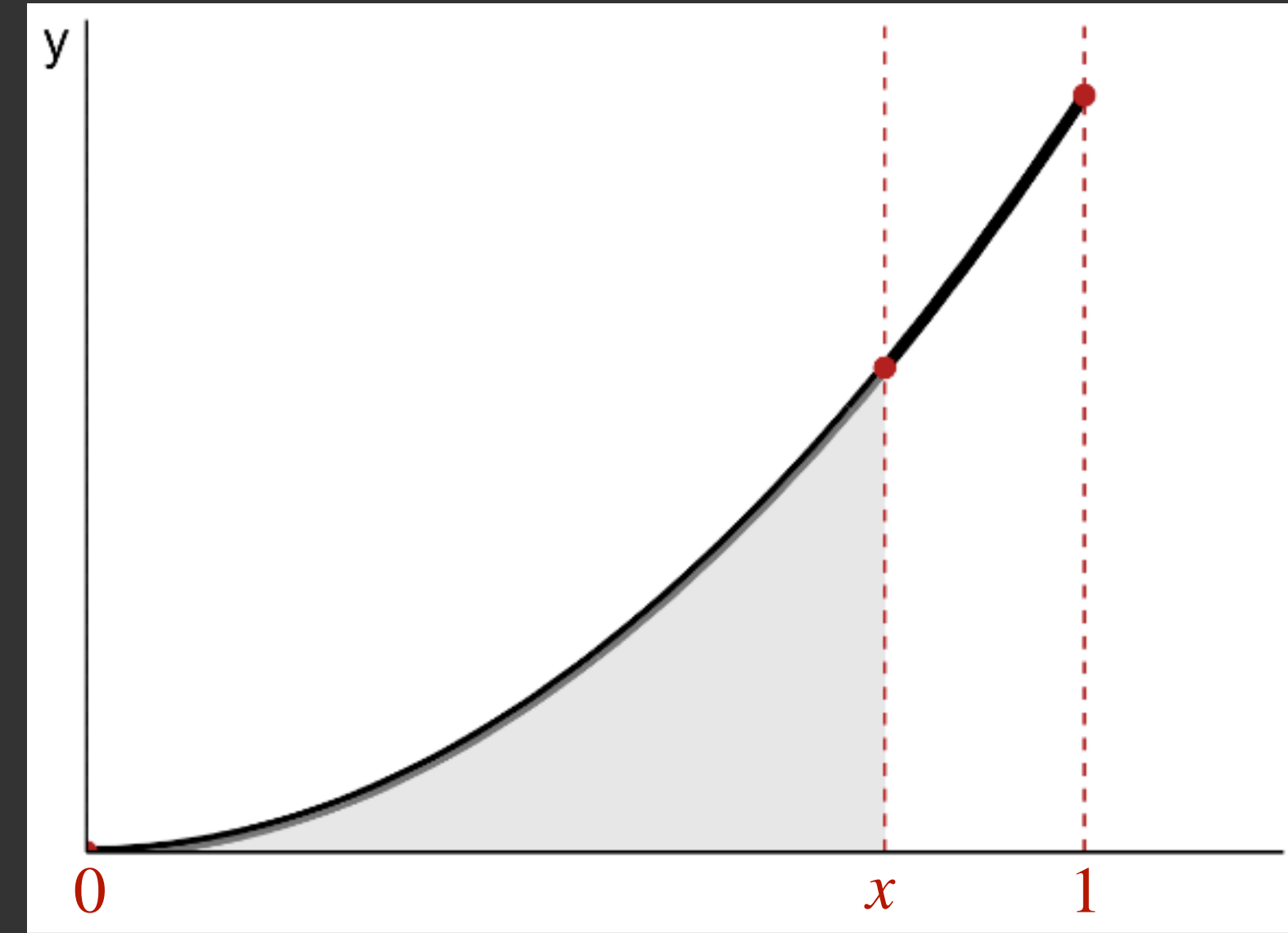
The area up to  $x$  is represented by  $A(x) = \int_0^x t^2 dt$  ] **indefinite integral**

We know  $A'(x) = x^2 \implies A(x) = \frac{1}{3}x^3$

This holds for any constant  $C$ :  $\frac{d}{dx} \left( \frac{1}{3x^3} + C \right) = x^2$

What is our  $C$ ?  $A(0) = \left( \frac{1}{3(0)^3} + C \right) = \int_0^0 t^2 dt = 0 \implies C = 0$

Further we have  $A(1) = \frac{1}{3}x^3 \implies \underbrace{\int_0^1 t^2 dt}_{\text{definite integral}} = A(1) - A(0)$  where  $A'(x) = x^2$



# the fundamental theorem of calculus, part 1

the fundamental theorem of calculus, part 1