

# Concepts of infinity

Peter Rowlett

# What is infinity?

"1 Bigger than 6 the biggest thing ever and then  
2 some, much 3 bigger than that, in fact really  
amazingly immense, a totally stunning size, real  
'Wow, that's big!' time. Infinity is just so big that by  
comparison, bigness itself looks really titchy.  
Gigantic multiplied by colossal multiplied by  
staggeringly huge is the sort of concept we are  
trying to get across here."

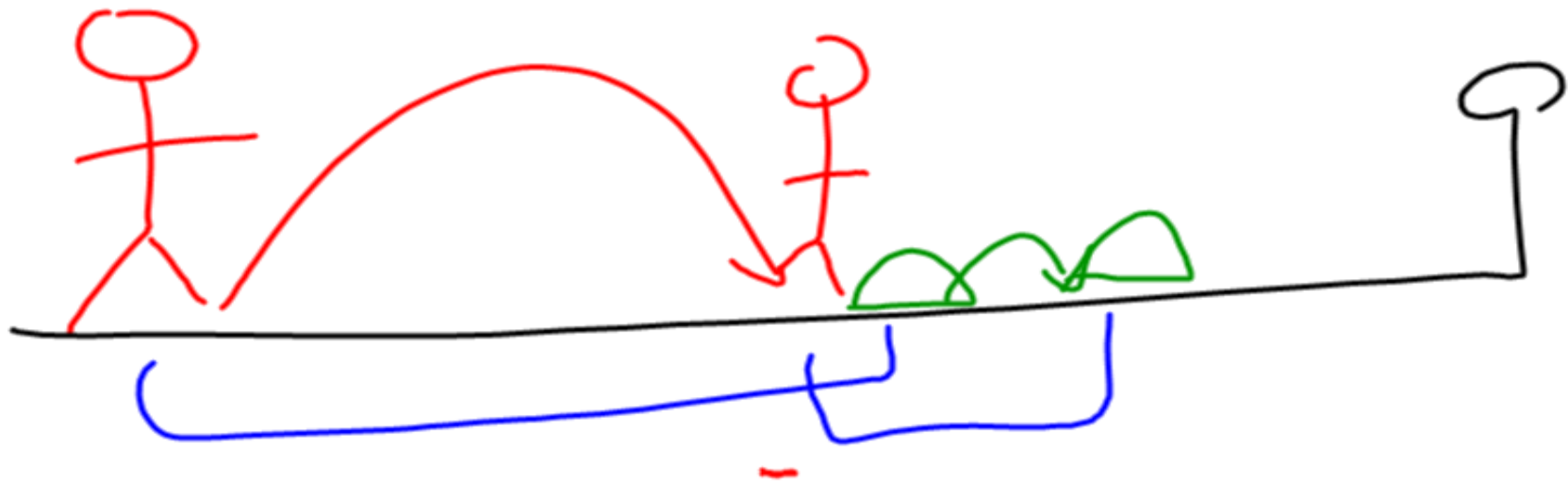
- The Hitchhiker's Guide to the Galaxy, Douglas Adams

Adding an infinite number of things

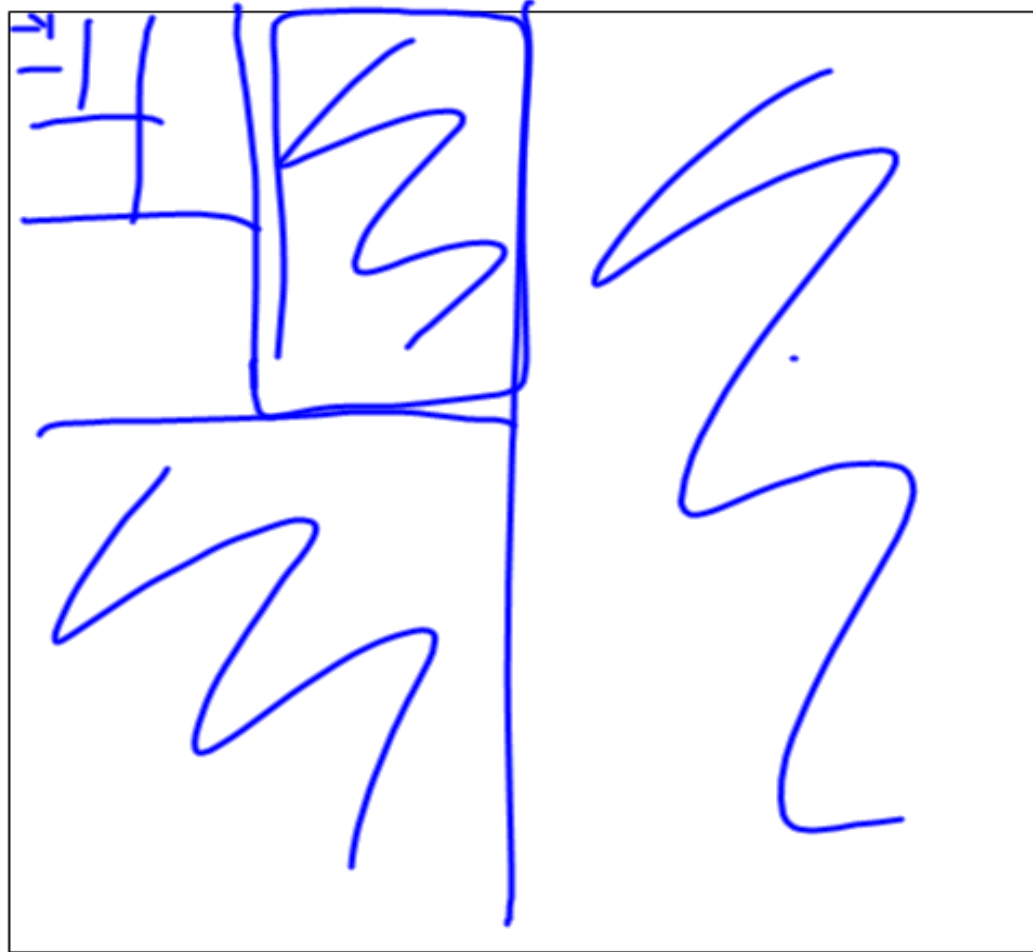
# Xeno's paradox of Achilles and the Tortoise

Achilles races a tortoise. He gives the tortoise a head start. How long does it take him to catch the tortoise?

# Xeno's paradox of Achilles and the Tortoise



Adding an infinite number of things...redux



$$\frac{1}{2^n}$$

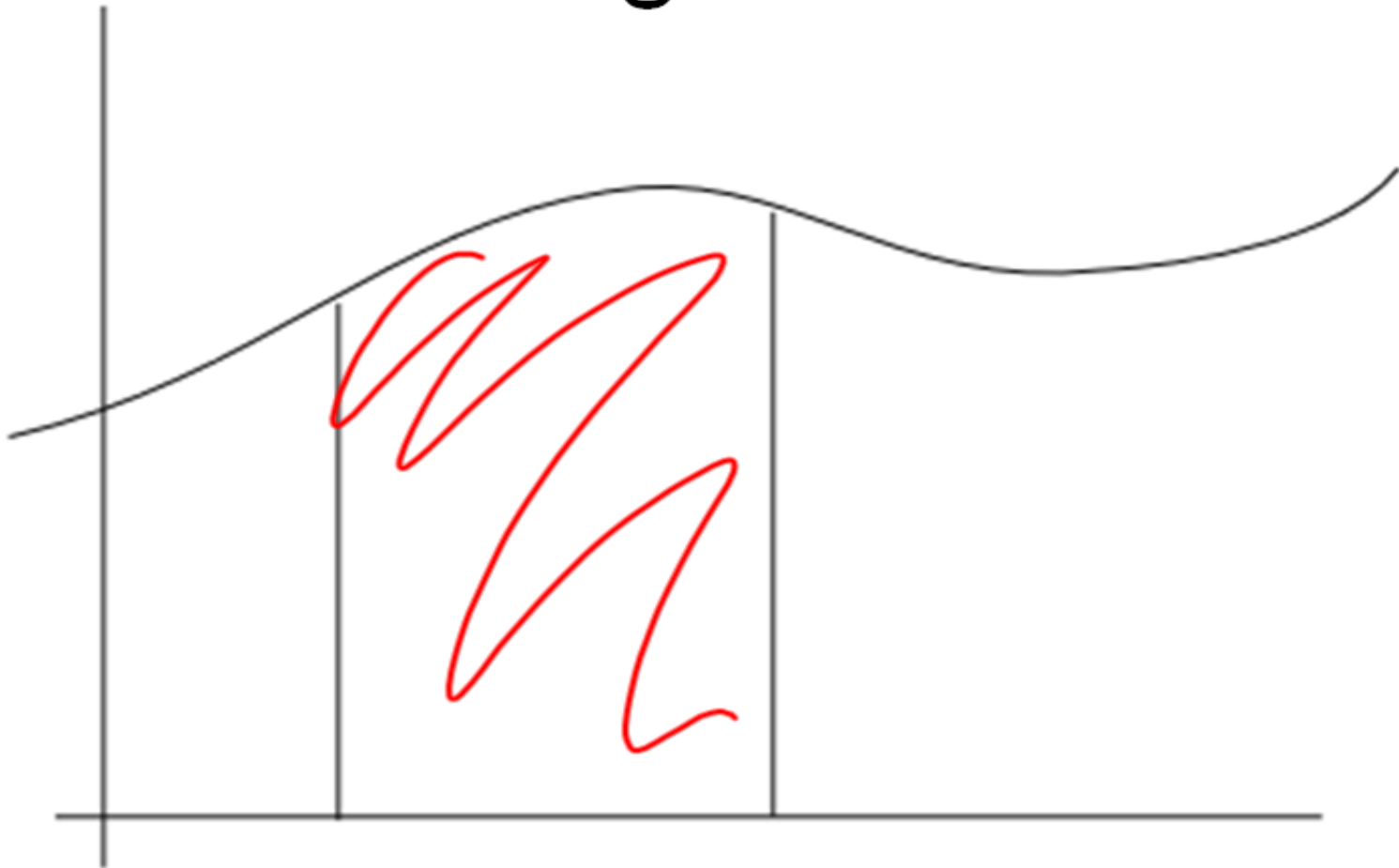
Adding an infinite number of things...redux

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \dots + \frac{1}{2^n} + \dots$$

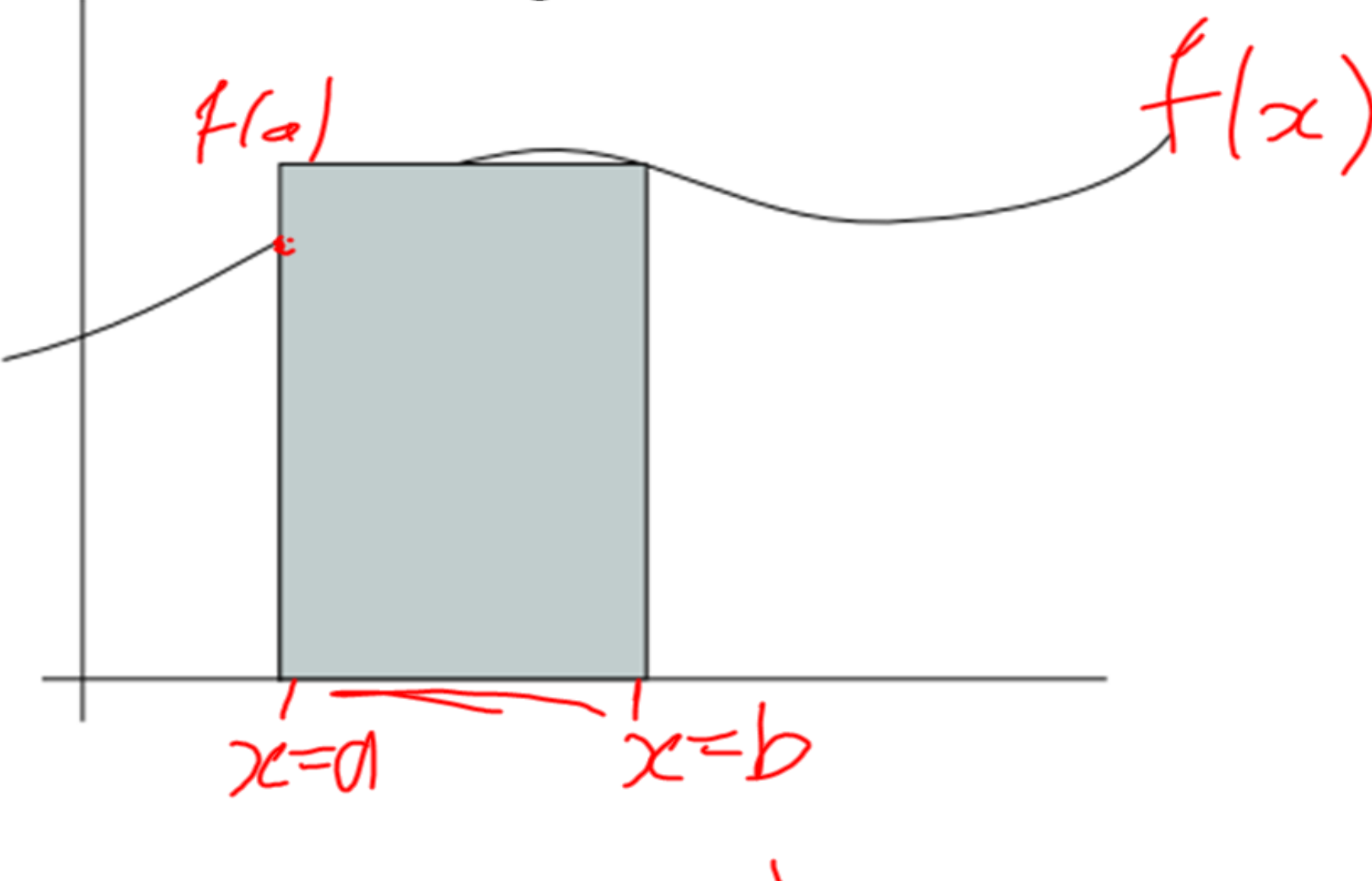
$\rightarrow 1$

as  $n \rightarrow \infty$

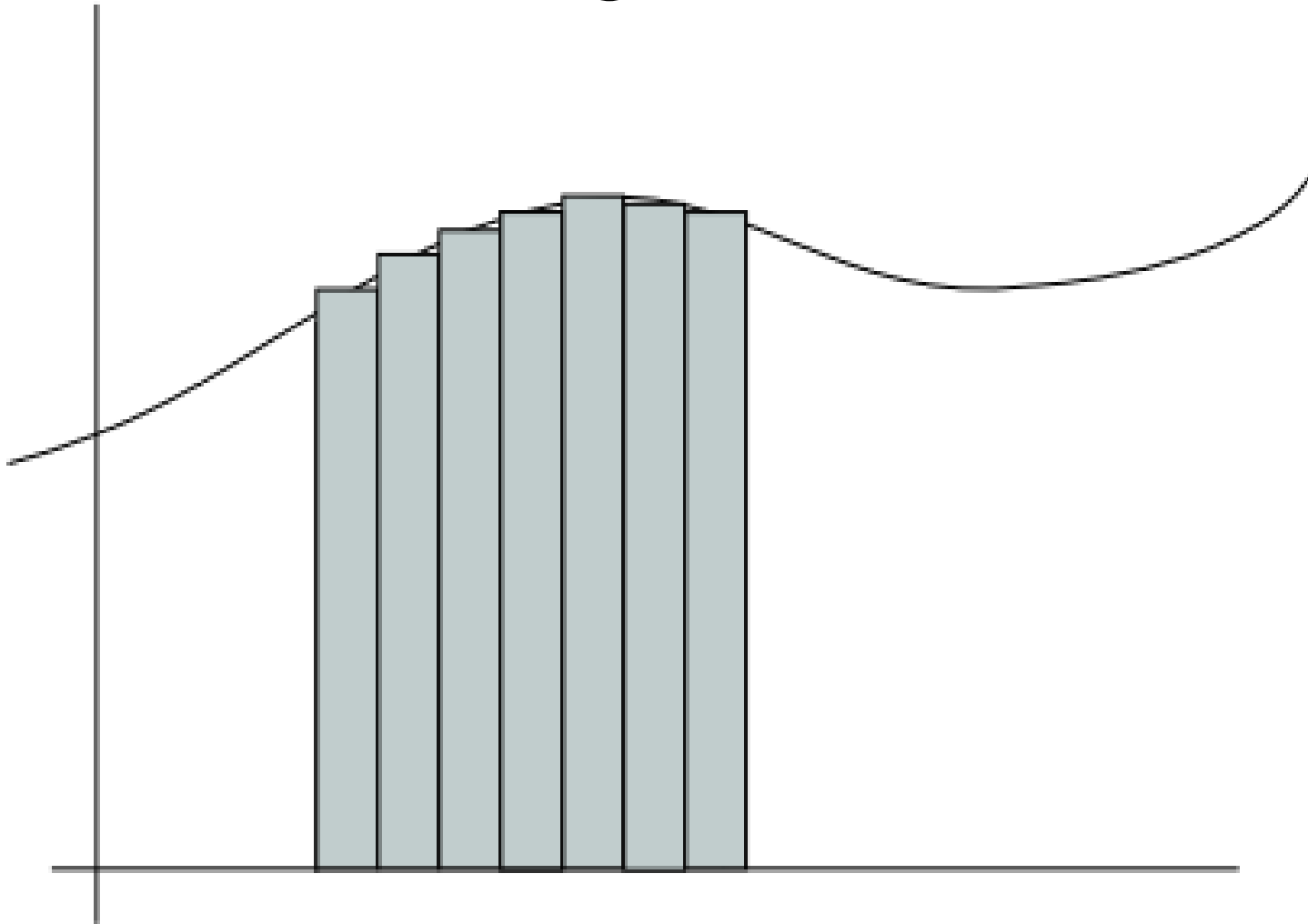
# Integration



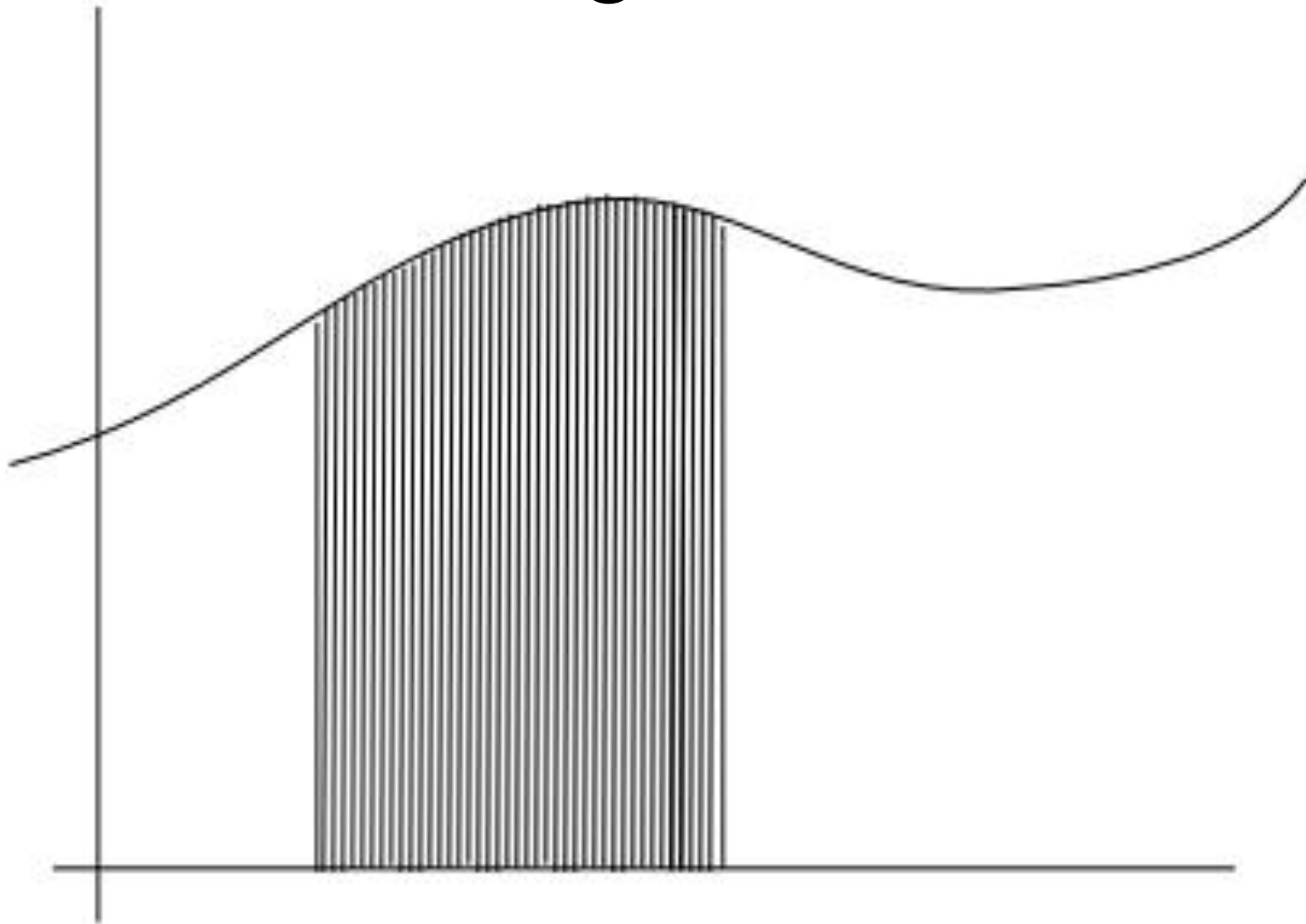
# Integration



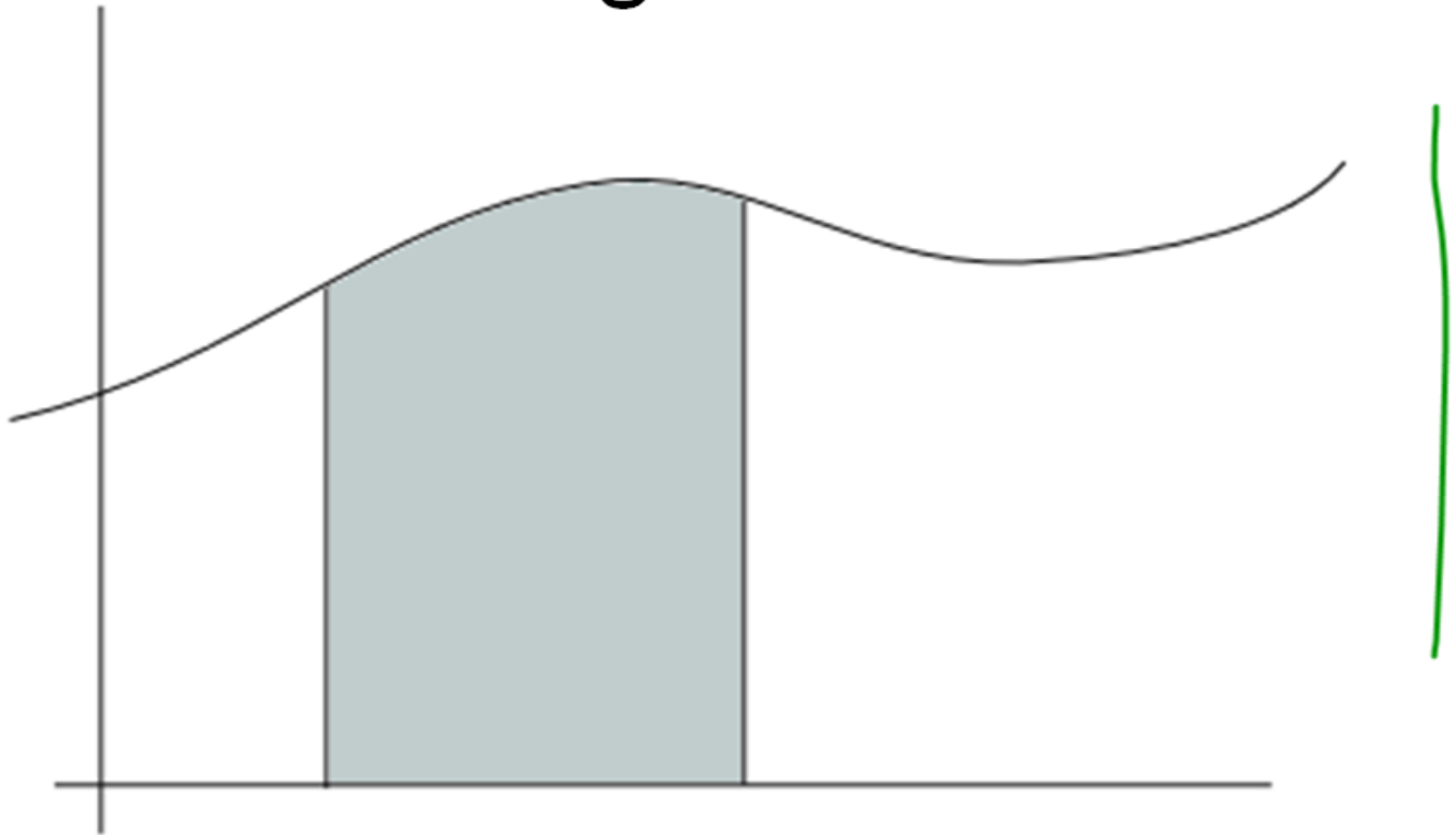
# Integration



# Integration



# Integration



# Summary

- We can add an infinite number of numbers and obtain a finite result.
- In integration, we are finding a formula which enabled us to add an infinite number of infinitesimally small slithers of an area to find the *exact* value of this area.