

Calculus M211

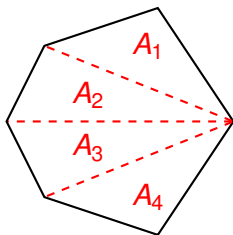
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Motivation and Overview

How to compute the area of a polygon?

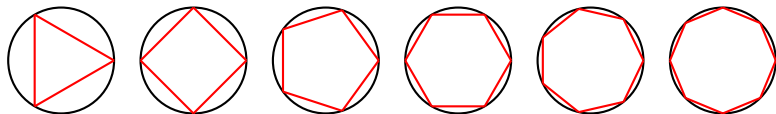


The ancient Greek did it as follows:

- ▶ divide the polygon into triangles
- ▶ compute the area of the triangles (and sum them up)

Motivation and Overview

But what did the ancient Greek do with curved figures?



They inscribed polygons into the figure:

- ▶ first a polygon with 3 points \implies area $A_3 = 1.29904$,
- ▶ first a polygon with 4 points \implies area $A_4 = 2.0$,
- ▶ first a polygon with 5 points \implies area $A_5 = 2.37766$,
- ▶ ... $A_{10} = 2.93892$, $A_{100} = 3.1395$, ...

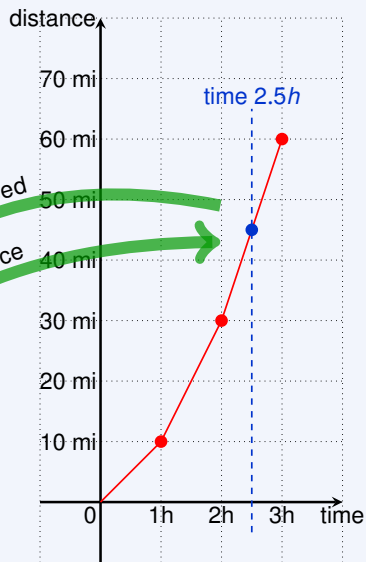
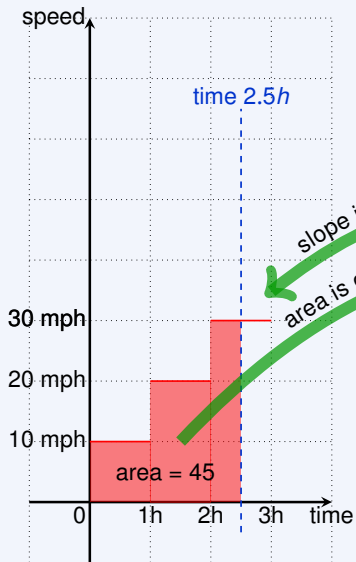
If you continue, you will see:

- ▶ the values get closer and closer to $\pi = 3.141592653\dots$

Area A of the circle is the **limit** of the sequence A_3, A_4, A_5, \dots

$$A = \lim_{n \rightarrow \infty} A_n$$

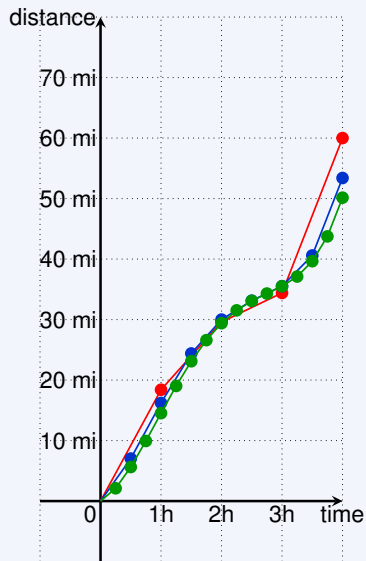
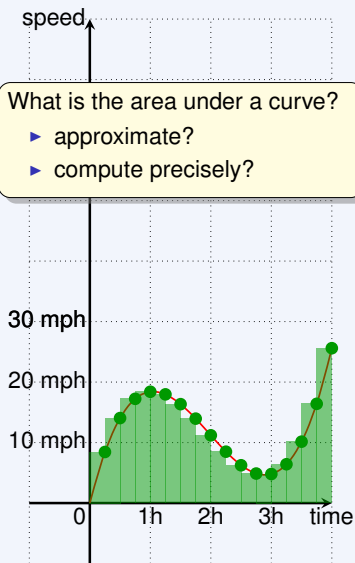
Motivation and Overview



Motivation and Overview

What is the area under a curve?

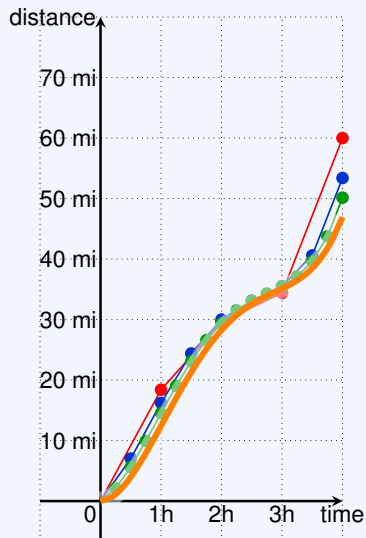
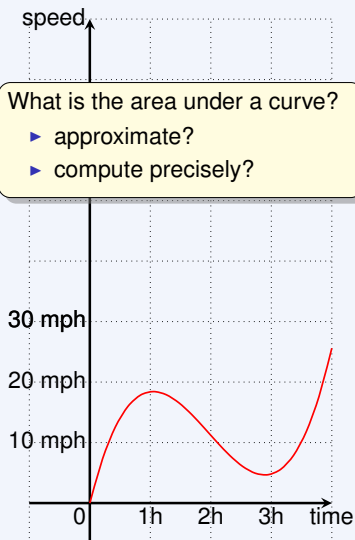
- ▶ approximate?
- ▶ compute precisely?



Motivation and Overview

What is the area under a curve?

- ▶ approximate?
- ▶ compute precisely?



The finer approximations get closer and closer to the precise solution ——— .