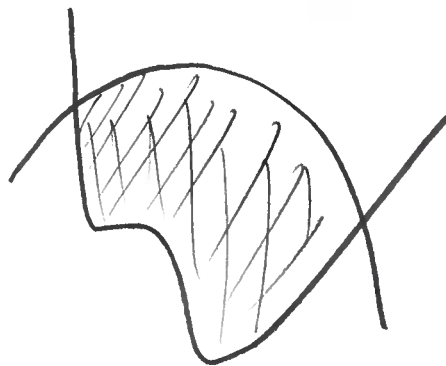
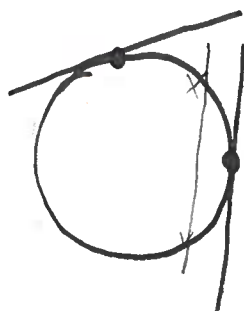


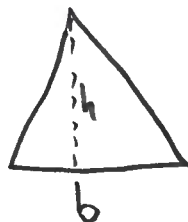
What is calculus?

- math of the mid-1600s

Old Geometry problems (Ancient Greece)



Area = wh



Area = 1/2 bh

$\pi = 3.1415...$
42 decimal places

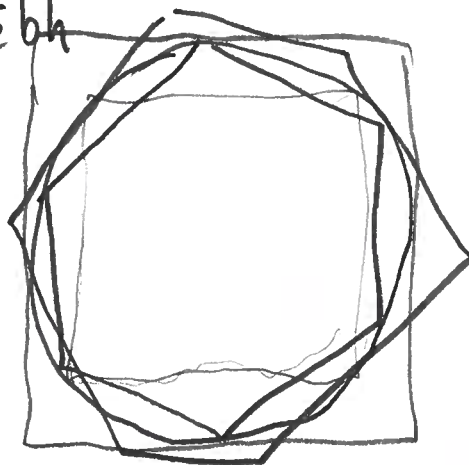


~~Area = 2r * const~~

Area = (const) * r²

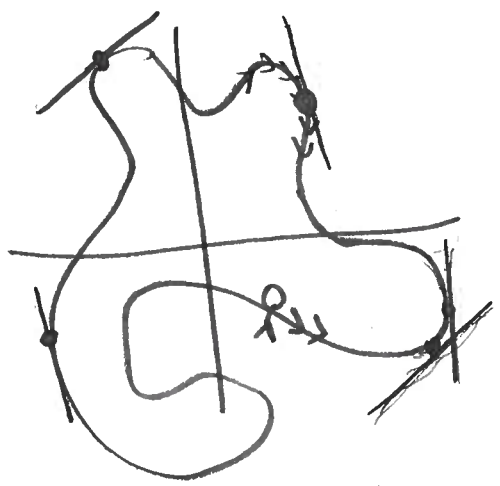


Circumf = (2r)(const)

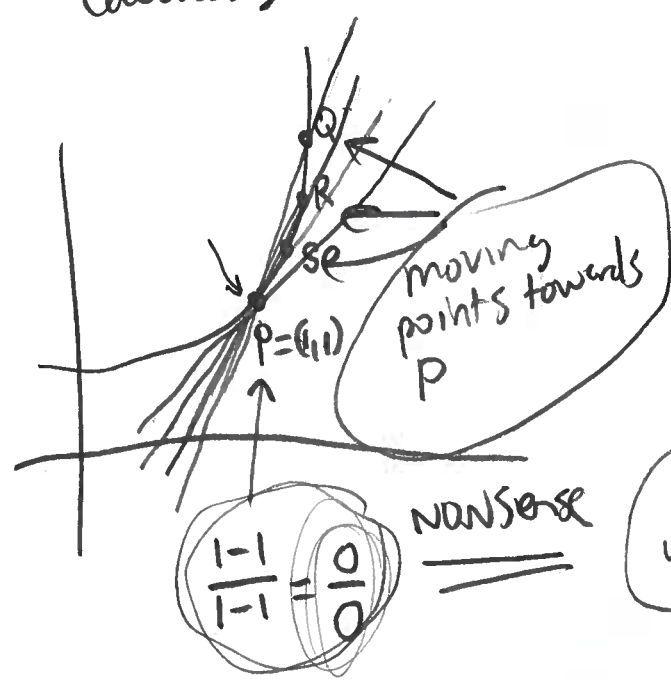


Tangent line problem

given any curve,
can I find a tangent
line to curve at a
specified point?

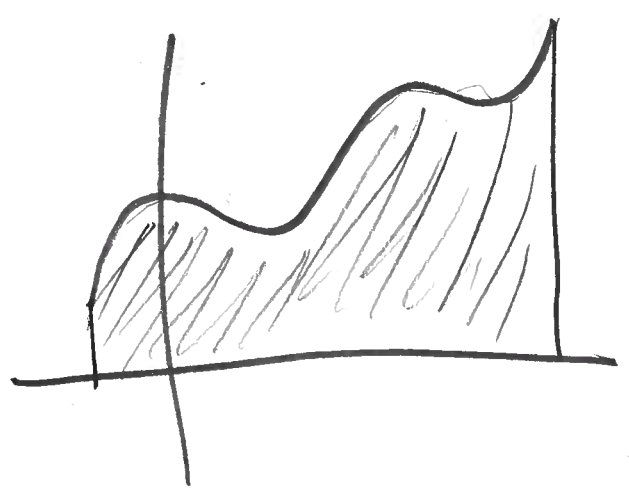


differential
calculus

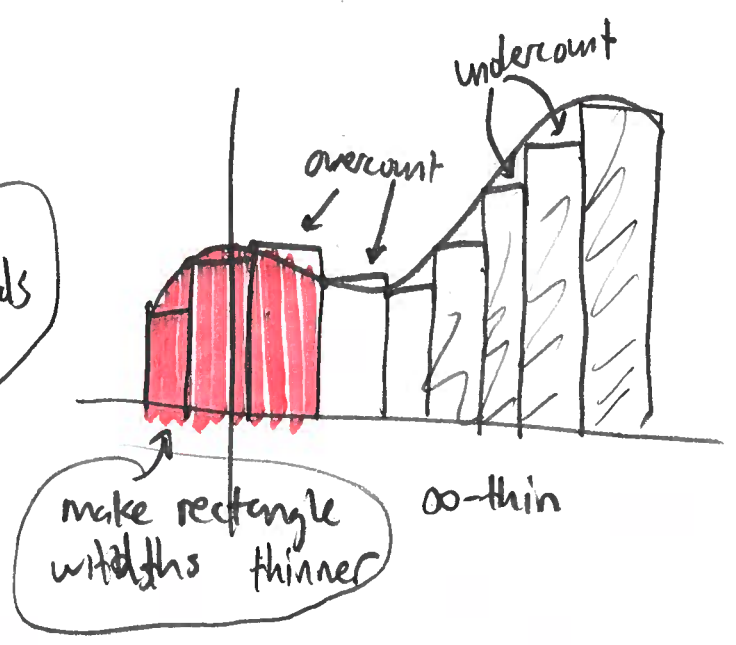


Area problem

given an ^{positive} curve
what is the area
below it?



integral
calculus



Tan line pblm

Area pblm

3

Ancient Greece

Archimedes



Chinese 400s AD (Liu Hui)

Indian Kerala school

Middle East 600s AD

1665-1666 - Great Plague of London
(bubonic plague)

Isaac Newton → ~~published~~
written 1665-1666
published 1693

Gottfried Leibniz → published 1684

Calculus controversy

~~Newton~~
 $\frac{dy}{dx}$

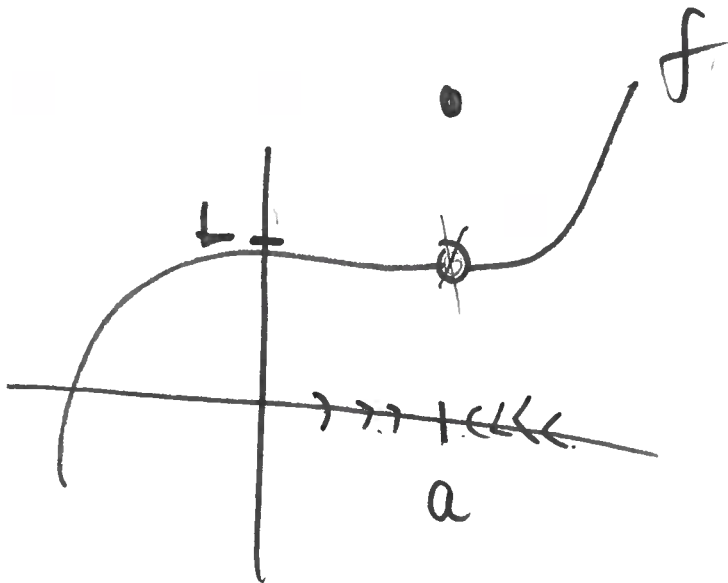
Leibniz
 $\frac{dy}{dt}$



proof assistants

Limits

4



$$\lim_{x \rightarrow a} f(x) = L$$

$$f: X \rightarrow Y$$

domain

$$f(x) = x^2$$

codomain

$$f: [0,1] \rightarrow [0,1]$$
$$f(x) = x^2$$

$$x = \frac{1}{2} \quad f(x) = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$