Math 2200

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Boyd 437

Office hours W 11-1

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assignments start 8AM date assigned
due 8AM following class day
answers available online 1PM day due

3 exams + final + HW 20% each

Reading assignment 1 Read 1.5, 2.1

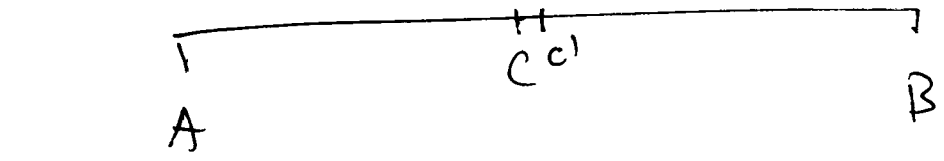
webwork uga → google

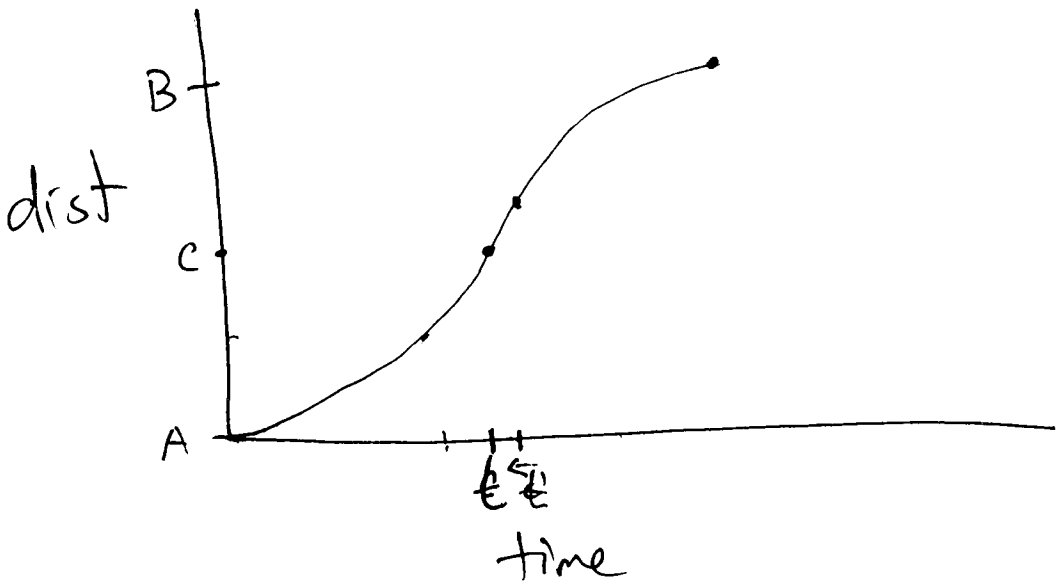
Survey

1) Name (optional)
2) Year
3) Major
4) Why are you in this course?
5) What do you want to get out of this course?
6) Math comfort level (1-10)
7) Have you taken Calculus before?

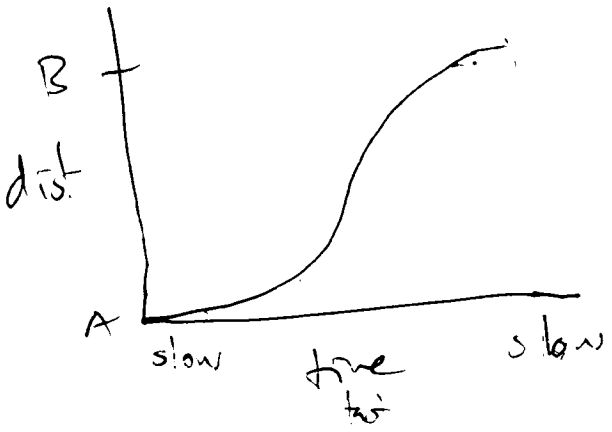
Differential Calculus

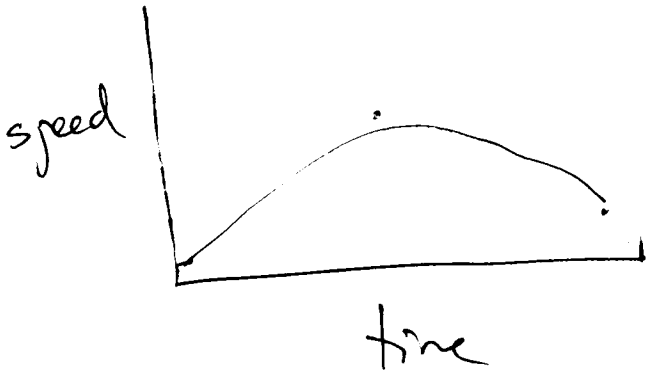
Distance Velocity



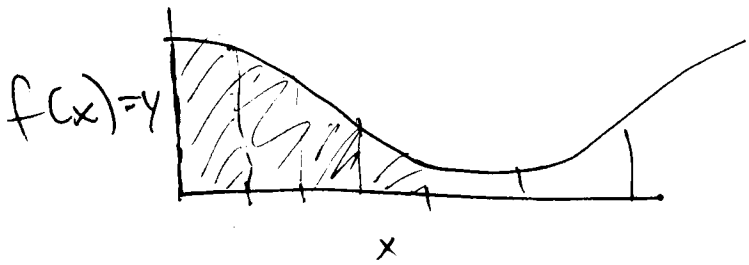


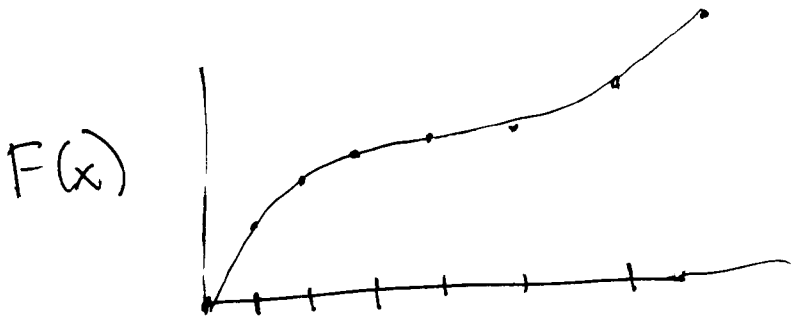
"limit" as t_2 gets close to t_1 will take the speed in the interval from t_1 to t_2


B
dist
A
slow
time
slow


speed
time

Integral Calculus





Fundamental Theorem of Calculus

area undercurve $\longleftrightarrow$ rate of change

opposites

Why is this useful?

Language of derivatives & integrals
extremely useful & comes up everywhere

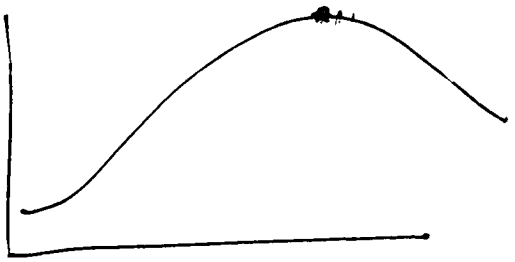
- social / biological sciences
  population model
  rate of population change proportional
  to size of population

differential
eqn
)
flex are everywhere!

- economics
  how does demand change
  w/ price?

- Optimization

Rev(price)



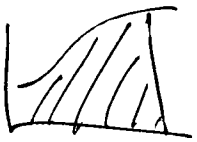
maximums & mins

occur when rate of change

drops to 0.

20 m.

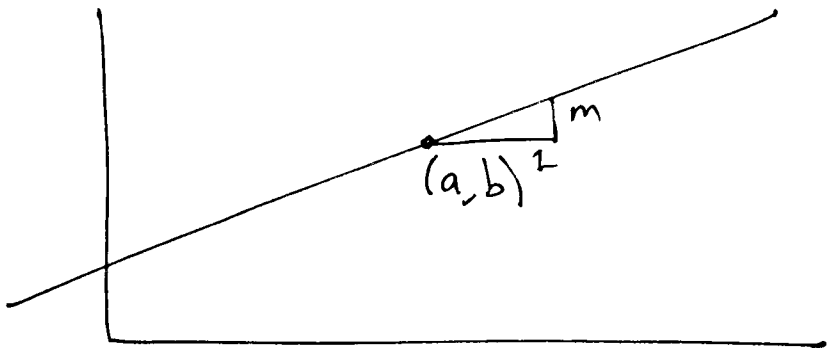
Overview of Calculus



Rates of Change
Derivatives
Differential Calculus

Areas under Curves
Integral
Integral Calculus

Beginning: Lines

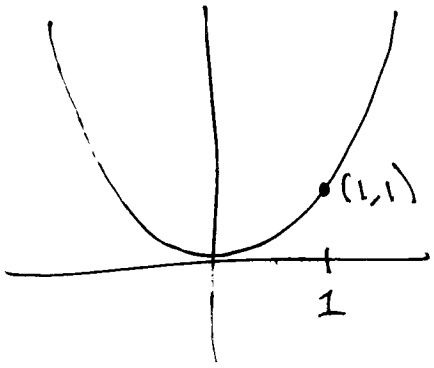


Point slope form $y - b = m(x - a)$

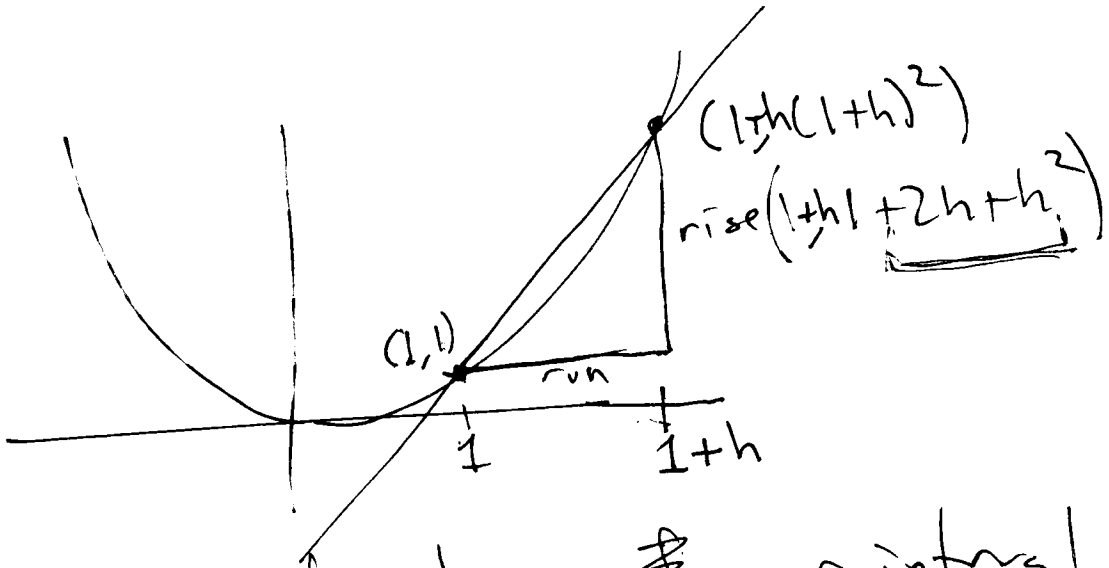
$m = \text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x}$

m = rate of chge. of f $f(x) = y = m(x - a) + b$

Next $f(x) = x^2$



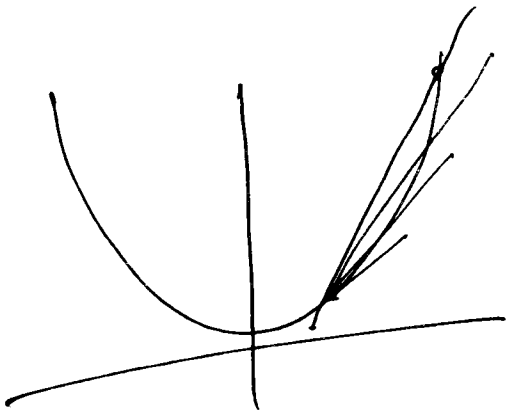
what's the rate of change of $f(x)$ at $x = 1$



rate of change over interval given by rise/run in the interval

$$\text{rise/run in interval} = \frac{\text{rise}}{\text{run}} = \frac{(1+2h+h^2)-(1)}{(1+h)-(1)}$$

$$= \frac{2h+h^2}{h}$$



rate of change over interval between 1 & 1+h

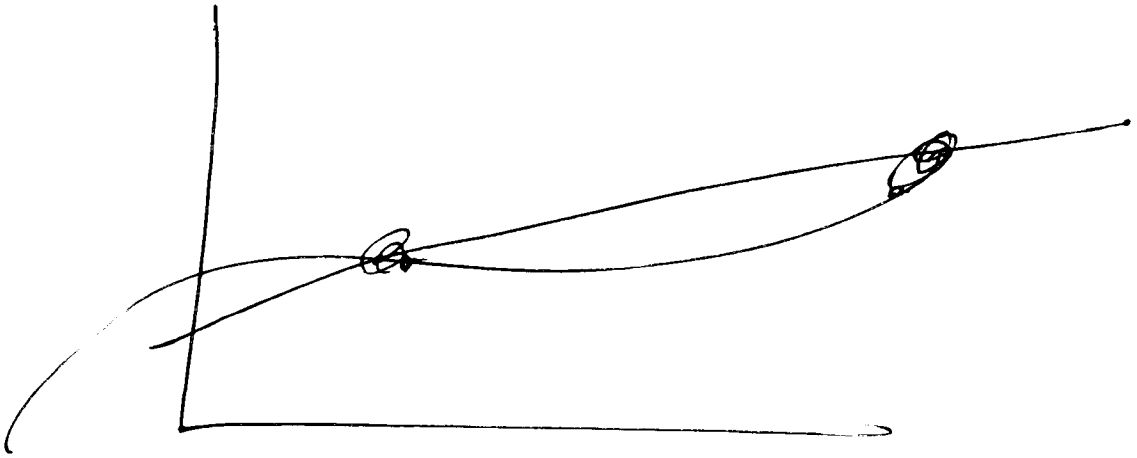
is $\frac{2h+h^2}{h}$

what if h gets smaller & smaller?

$$\frac{2h+h^2}{h} = \frac{h(2+h)}{h} = 2+h.$$

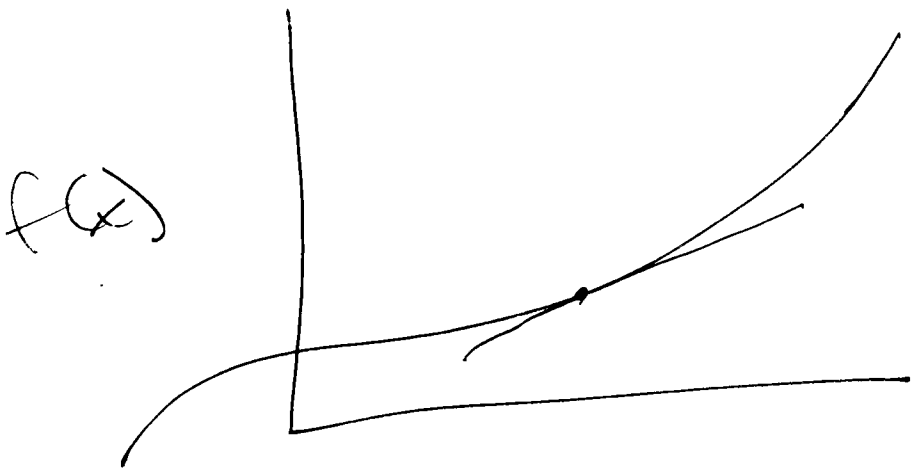
2+h gets close to 2.

answer: rate of change at $x = 1$ is 2.



line passing through 2 pts on graph is called a "secant line"

a line "kissing" graph at a single point is called the tangent line to the graph at this point



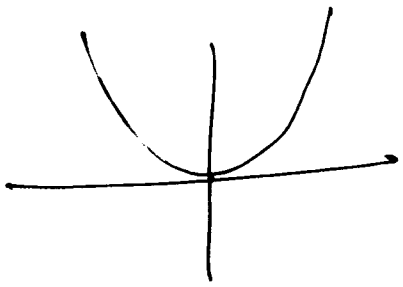
slope predictor function =

rate of change function

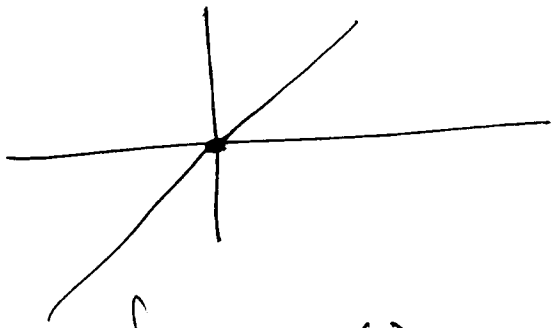
(usually called $m(x)$)

example

$f(x) = x^2$

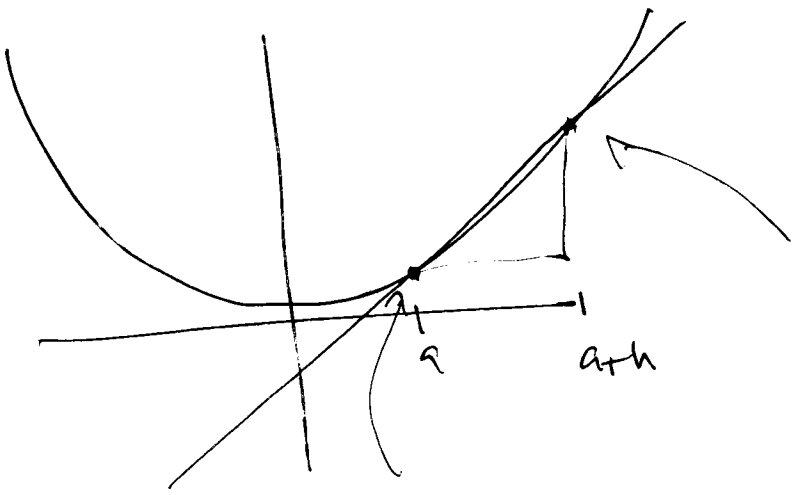


$m(x)$



we know so far $m(1) = 2$

$f(x) = x^2$



$(a+h, f(a+h))$

$(a+h, (a+h)^2)$

$(a+h, a^2+2ah+h^2)$

$(a, f(a))$

(a, a^2)

$$\frac{\text{rise}}{\text{run}} = \frac{f(a+h)-f(a)}{(a+h)-a} = \boxed{\frac{f(a+h)-f(a)}{h}}$$

$$\frac{(a^2+2ah+h^2)-(a^2)}{h} = \frac{2ah+h^2}{h}$$

$$= \frac{h(2a+h)}{h} = 2a+h$$

slope of secant line between $(a, f(a))$ & $(a+h, f(a+h))$

as $h \to 0$ $\quad 2a+h \to 2a$

Slope of tg line at $x = a$

i.e. the rate of change of $f(x) = x^2$ at $x = a$

is $2a$.

$m(a) = 2a$

$m(x) = 2x$

So the slope predictor function for

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

in general if

$f(x) = ax^2 + bx + c$ $\quad m(x) = 2a + b$