④ $y = \ln(\sin^2 x)$

$y = \ln(\sin x)^2$

$y' = \frac{1}{\sin^2 x} \cdot 2\sin x \cdot \cos x$

$= \frac{2\sin x \cos x}{\sin^2 x}$

$= \frac{2\cos x}{\sin x} = 2\cot x$

Ex. $y = \sin(e^{3x})$

find $\frac{dy}{dx}$

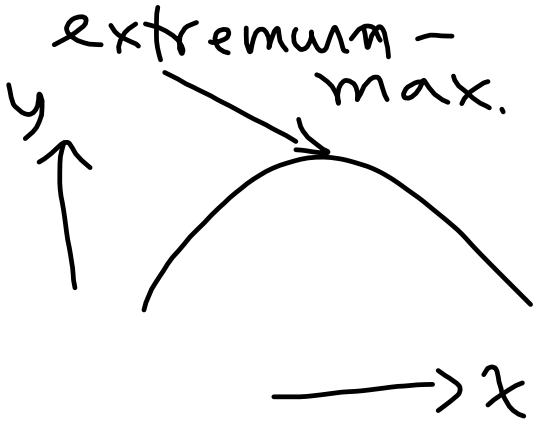
$\frac{dy}{dx} = \cos(e^{3x}) \cdot e^{3x} \cdot 3$

$= 3e^{3x}\cos(e^{3x})$

Topic: Extrema

(plural of extremum)

means: maximum or minimum value(s)



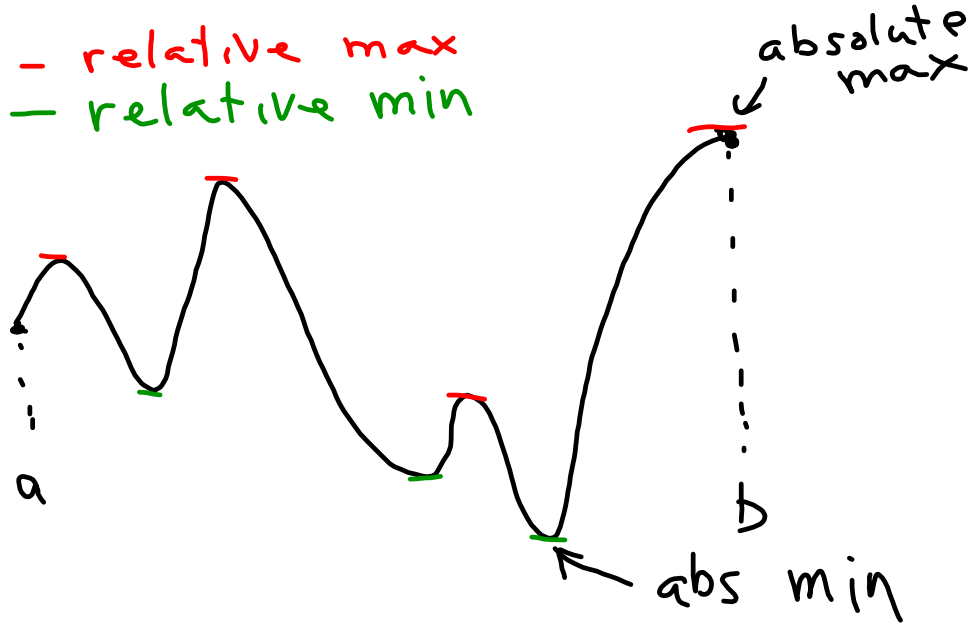
output, usually y

EVT: Extreme Value Theorem

if f continuous on $[a, b]$,

f has absolute (global) max and min on $[a, b]$

Besides absolute(global) max/min, we may have relative(local) max & min



Topic: critical point of a function.

* A c.p. of a fcn f is an x-value at which the derivative f' is either ① zero, or ② undefined

An extremum of f on an interval can only occur at

① a critical pt,

or

② an end point of the interval.

p. 194 #11 (analytic)
extreme values and where they occur

$f(x) = \frac{1}{x} + \ln x$

$0.5 \le x \le 4$

- we have 2 end points
- critical points?
find $f'(x)$

$f'(x) = -\frac{1}{x^2} + \frac{1}{x}$

c.p. @ $x = 0$ ✗

@ $x = 1$

$x = .5$: $\frac{1}{.5} + \ln .5 = 2 + \ln .5 \approx 1.3$

$x = 1$: $\frac{1}{1} + \ln 1 = 1$

$x = 4$: $\frac{1}{4} + \ln 4 = .25 + \ln 4 \approx 1.6$

abs min: (1, 1)

abs max: (4, 1.6)