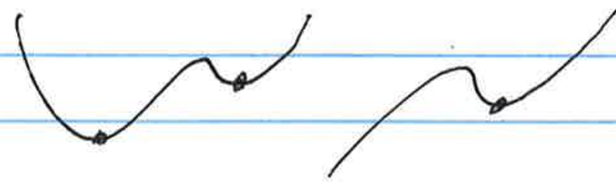
Math 211 - 2015S - W6 - Friday (Pg 1)

Review

Local minimum at p means - function takes least value at p considering all nearby p



Examples

local max - analogous

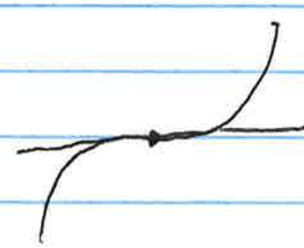
Critical point: A point p where $f'(p)=0$ or $f'(p)$ is not defined.

If p is a min or a max then p is a critical point or p is the endpoint of an interval of the domain of definition of f

Eg

Caution: if p is a critical point of f then p may be neither a min nor a max

eg:



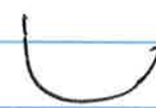
slope 0

Second derivative test

* find critical points
* take second derivative at critical points
* if $f''(p) > 0$ $\cup$ p is a minimum
* if $f''(p) < 0$ $\cap$ p is a maximum
* if $f''(p) = 0$ cant tell.

First derivative test

* Comes from fact that 1st derivative can only change sign at critical points
* test 1st derivative ~~between~~ between critical points
* If function is decreasing before then increasing after.

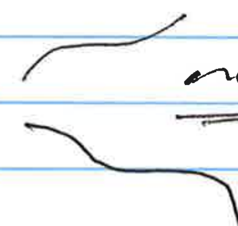


min

* If function is increasing befor then decreasing after

max

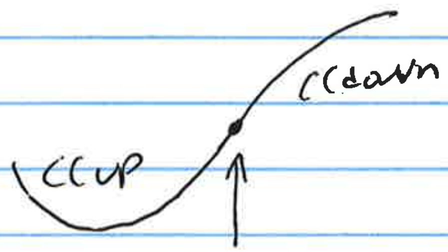
If Function is increasing both before and after neither
" decresing "
" "



neither

New **Inflection Point**

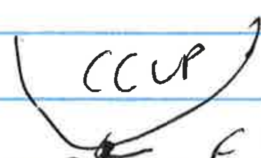
A point at which the graph of a function changes concavity is called an inflection point of f



inflection point. Here the slope of the tangent line is positive - not a critical point.

This point is both a critical point and an inflection point

To find inflection points solve $f''(p)=0$ for p but becareful, Not every point where $f''(p)=0$ is an inflection point, Consider $f(x)=x^4$



$f''(0)=0$

Just like not every critical point is a min or a max

Show instead that

$F''(x)$ changes sign before ~~x~~ and after p (like first deriv test

Or $F'''(x) \neq 0$ (like second deriv test)

~~Bu~~ Book problems aren't that tricky though,

$\boxed{\text{Global min / Global max}}$

If we want to maximize profit
we don't just want a local maximum
we want the Global maximum,
The quantity that gives $\pi(q)$ its greatest value
everywhere

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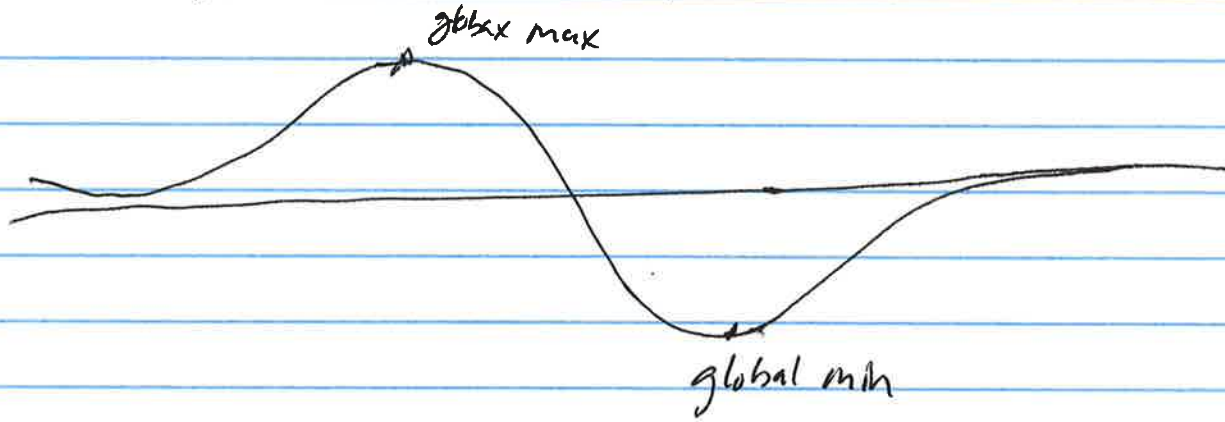
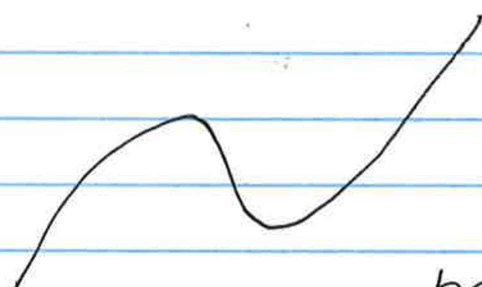
One method to find global min and max

- Find all critical points and compare respective critical values (values at function at critical points)

This works for this function



However it doesn't work for this function



This Function has no global min / or max

because no value is greater than ~~any~~ every other value (no value is less than every other value

The thing to do instead is to compare all critical values and graph the function

$\boxed{\text{However}}$ there is one situation where comparing critical values always works

When the function is only defined on an interval $[a,b]$ and the domain of definition includes the endpoints a, and b

Must compare all critical values and also values $f(a)$, $f(b)$

Don't have to classify critical points as min/max

The greatest value will be max
least min,