

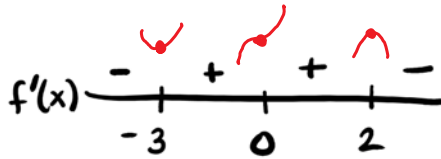
5.3 Day 1 Notes

Wednesday, November 2, 2016 7:13 PM

Calculus AB

5.3 Connecting f , f' , and f''

1. For the continuous function $f(x)$, the sign chart for $f'(x)$ is given:



Determine the locations of all local mins and maxes. *($x=0$ is neither)*

local min @ $x=-3$

local max @ $x=2$

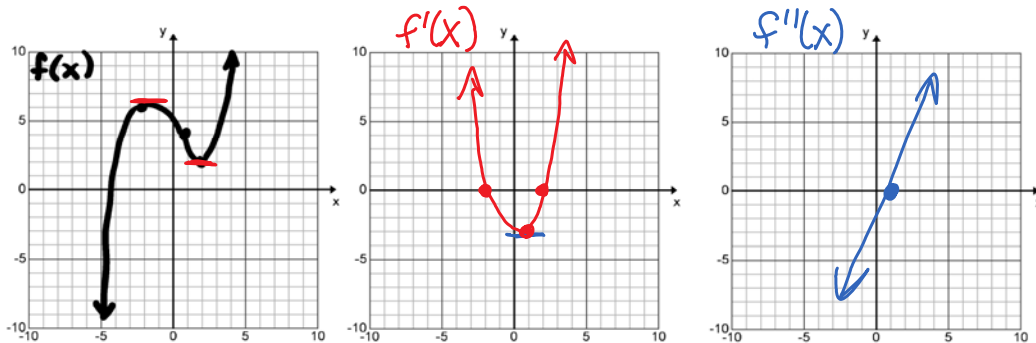
1st Derivative Test for Local Extrema *(Justification)*

For continuous function, at critical point c :

① *f has a local max if $f' > 0$ for $x < c$ and $f' < 0$ for $x > c$*
[f has a local max at $x=c$ if f' changes from pos to neg at $x=c$]

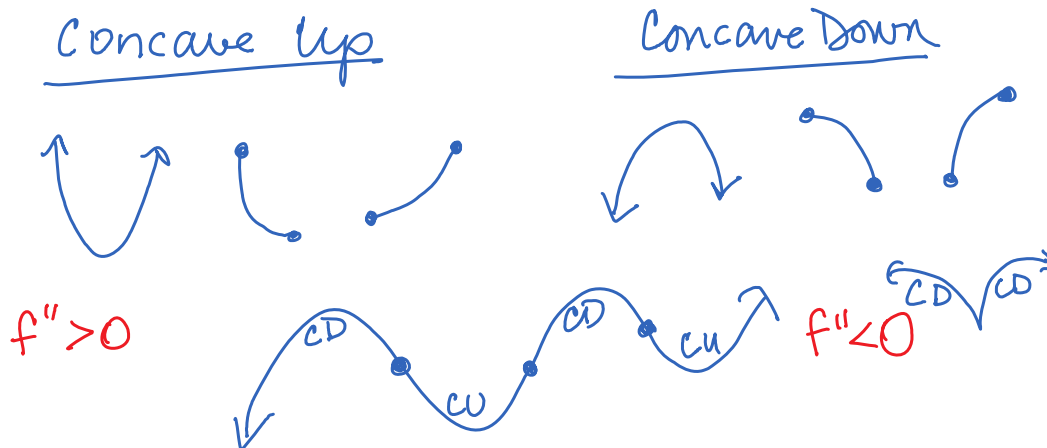
② *f has a local min if $f' < 0$ for $x < c$ and $f' > 0$ for $x > c$*
[f has a local min at $x=c$ if f' changes from neg to pos at $x=c$]

2. Draw $f'(x)$ and $f''(x)$. Describe what is happening at $x = -2, 1,$ and 2 for each graph.



	x	$f(x)$	$f'(x)$	$f''(x)$
1	-2	local max	zero	(neg)
	1	concavity changes	(abs) local min	zero
	2	local min	zero	(pos)

3. Concavity and Points of Inflection



Point of Inflection (POI): where concavity changes

Second derivative = 0, undefined and change signs. $f''(x) = 0$, and changes signs

$f''(x) > 0$ Concave Up
 $f''(x) < 0$ Concave Down

① Find POI and where f is concave up and down

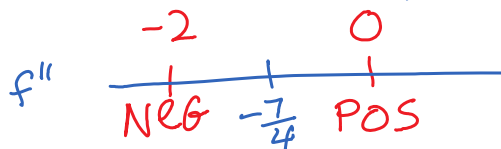
$$f(x) = 4x^3 + 21x^2 + 36x - 20$$

$$f'(x) = 12x^2 + 42x + 36$$

$$f''(x) = 24x + 42 = 0$$

$$24x = -42$$

$$x = -\frac{7}{4}$$



POI @ $x = -\frac{7}{4}$ bc

$f''(x) = 0$ and changes sign @ $x = -\frac{7}{4}$

concave up $(-\frac{7}{4}, \infty)$
 bc $f'' > 0$ $(-\frac{7}{4}, \infty)$
 concave down $(-\infty, -\frac{7}{4})$
 bc $f'' < 0$ $(-\infty, -\frac{7}{4})$