4.2

Wednesday, June 24, 2009
7:16 AM

Concave Up

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$f''(x) > 0$

Concave Down

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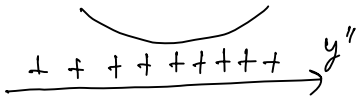
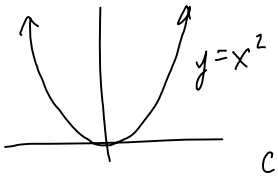
$f''(x) < 0$

Ex. $y = f(x) = x^2$

$y' = 2x$

$y'' = 2$





C.U. on $(-\infty, \infty)$

Notation for 2nd Deriv.

$f''(x)$

$\frac{d}{dx}\left(\frac{d}{dx}f\right)$

y''

$\frac{d^2f}{dx^2}$ or $\frac{d^2y}{dx^2}$

Ex. $y = ax^2 + bx + c$

$y' = 2ax + b$

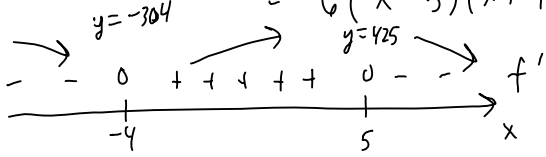
$y'' = 2a$

Ex. Find intervals of concavity & inflection points for

$f(x) = -2x^3 + 3x^2 + 120x$

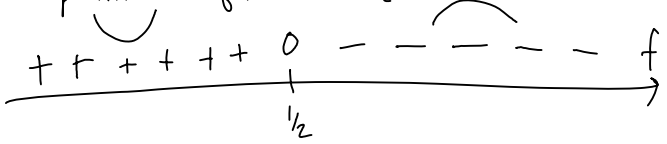
$f'(x) = -6x^2 + 6x + 120 = -6(x^2 - x - 20)$

$= -6(x-5)(x+4)$



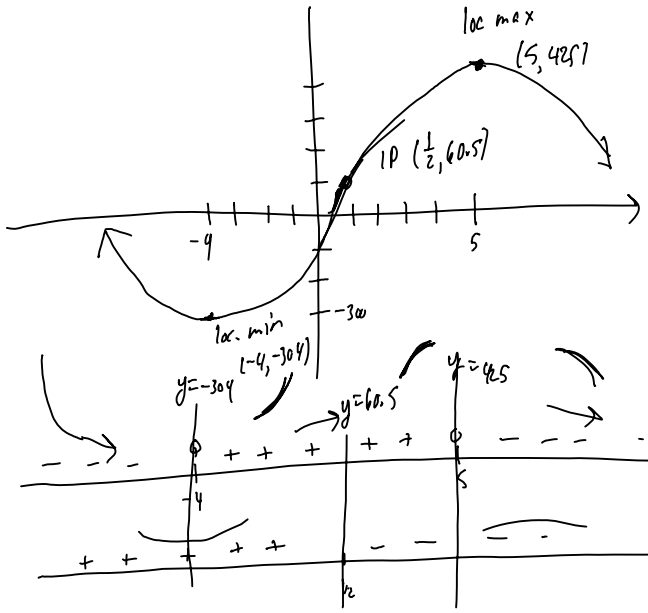
$f''(x) = -12x + 6 = -6(2x - 1)$

partition # of f'': $x = \frac{1}{2}$



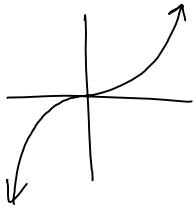
f is CU. on $(-\infty, \frac{1}{2})$ & CD on $(\frac{1}{2}, \infty)$

& f has an I.P. at $\left(\frac{1}{2}, f\left(\frac{1}{2}\right)\right) = \left(\frac{1}{2}, 60.5\right)$



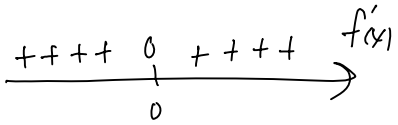
WARNINGS $f'(x) = 0$ does not always mean local max/min.

eg $f(x) = x^3$



$f'(x) = 3x^2$

$f'(0) = 0$

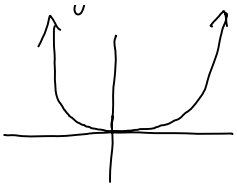


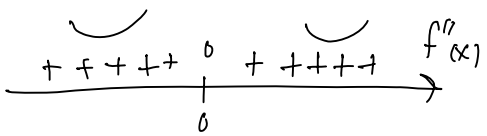
ALSO $f''(x) = 0$ does not always imply an inflection point

$f(x) = x^4$

$f'(x) = 4x^3$

$f''(x) = 12x^2$





f is CU on $(-\infty, \infty)$