2012/2013

Section 4.3 Notes

Review:

If $f'> 0$ on an interval, then f is increasing

If $f'< 0$ on and interval, then f is decreasing

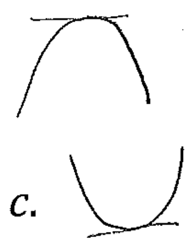
If $f'' > 0$ on an interval, then f is concave up

If $f'' < 0$ on an interval, then f is concave down

Inflection point : change in concavity

The first derivative test: Suppose that c is a critical number of a continuous function f.

a. f' + ⇒ -- at c, f has a local max at c.
b. f' -- ⇒ + at c, f has a local min at c.
c. f' does not change, no max or min at c.



The second derivative test: Suppose f'' is continuous near c.

a. If $f'(c) = 0$ and $f''(c) > 0$, then f has a local min at c.
b. If $f'(c) = 0$ and $f''(c) < 0$, then f has a local max at c.

Example 1: Given $y = 3x^4 - 4x^3 - 12x^2 + 5$ find:

a. intervals of increase and decrease.
b. Local max and min values.
c. Intervals of concavity and the inflection points.
d. Sketch the graph of y.

a)

$y' = 12x^3 - 12x^2 - 24x$

$y' = 12x(x^2 - x - 2)$

$y' = 12x(x-2)(x+1)$

$x = 0, 2, -1$

	$12x$	$x-2$	$x+1$	f'	f
$(-\infty, -1)$	$-$	$-$	$-$	$-$	$\downarrow$ Lmin
$(-1, 0)$	$-$	$-$	$+$	$+$	$\uparrow$ Lmax
$(0, 2)$	$+$	$-$	$+$	$-$	$\downarrow$ Lmin
$(2, \infty$	$+$	$+$	$+$	$+$	$\uparrow$

intervals of $\uparrow$ are $(-1, 0)$ and $(2, \infty)$

intervals of $\downarrow$ are $(-\infty, -1)$ and $(0, 2)$

b) $\left.\begin{matrix} f(-1) = 0 \\ f(2) = -27 \end{matrix}\right\}$ L min

$f(0) = 5$ L max

c) $y'' = 36x^2 - 24x - 24$

$y'' = 12(3x^2 - 2x - 2)$

C#'s $x = 1.2153$

$x = -.5486$

	f''	f
$(-\infty, -.5486)$	$+$	CU
$(-.5486, 1.2153)$	$-$	CD
$(1.2153, \infty)$	$+$	CU

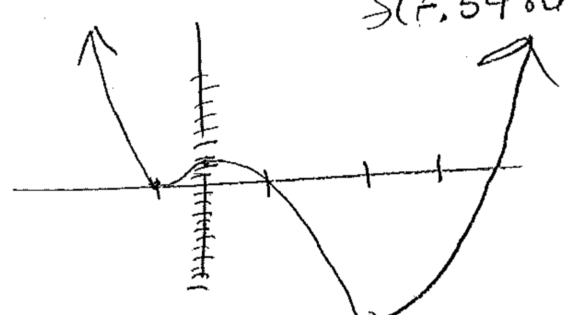
intervals are $(-\infty, -.5486)$ CU
$(1.2153, \infty)$

and $(-.5486, 1.2153)$ CD

IP $f(1.2153) = -13.357$

$f(-.5486) = 2.320$

d)



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