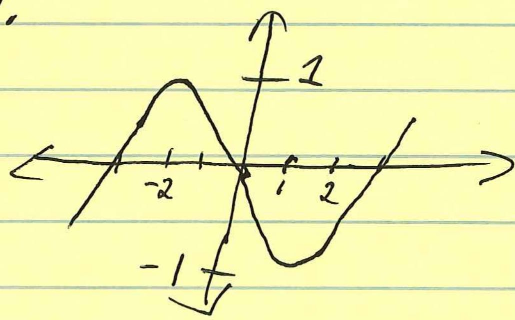
Mr. Konichek
Math 111
Hmwk 4.2

4.2 Pg. 282 (1, 4, 11, 13, 29, 31, 33, 34, 39, 51, 52, 61, 77, 78)

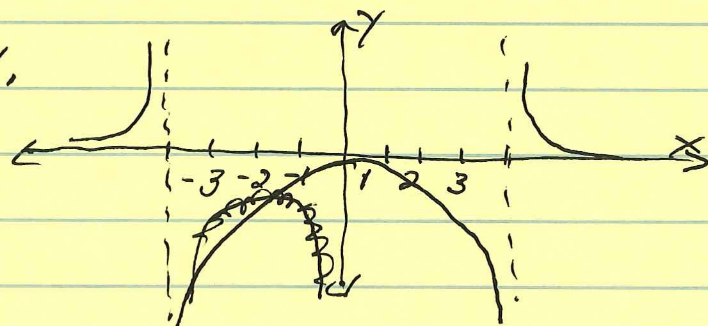
Determining intervals of Concavity
Inflection Points
relative extrema (2nd Derivative Test)

1.




$(-\infty, 0)$ concave downward
$(0, +\infty)$ concave upward
$(0, 0)$ inflection point

4.




$(-\infty, -4)$ concave upward
$(-4, +4)$ concave downward
$(4, +\infty)$ concave upward

Inflection points $x = -4$, $x = +4$

~~$(-4, +\infty)$ $(-\infty, -4)$~~
~~$(-\infty, +4)$ $(+4, +\infty)$~~

11. from Table on Top of page 282
(a)

13. (b)

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4.2 Cont Pg. 282 (29, 31)(33)

29. $f(x) = 2x^2 - 3x + 4$

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

$f''(x) = 4$

$(-\infty, +\infty)$ concave upward

31. $f(x) = 1 - x^3$

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

$f''(x) = -6x$

$-6x = 0$

$x = 0$

+ + + + | - - - -

(−1) 0 (+1)

$(-\infty, 0)$ concave upward

$(0, +\infty)$ concave downward

33. $f(x) = x^4 - 6x^3 + 2x + 8$

$f'(x) = 4x^3 - 18x^2 + 2$

$f''(x) = 12x^2 - 36x$

$12x(x-3) = 0$

$x = 0 \quad x = 3$

+ + + + | - - - - | + + + +

(−1) 0 (1) 3 (4)

(−)(−) (+)(−) (+)(+)

$(-\infty, 0)$ concave ~~downward~~ upward

$(0, 3)$ concave downward

$(3, +\infty)$ concave upward

4.2 cont (34, 49, 51)

34. $f(x) = 3x^4 - 6x^3 + x - 8$

$f'(x) = 12x^3 - 18x^2 + 1$

$f''(x) = 36x^2 - 36x$

$36x(x-1) = 0$

$x = 0 \quad x = +1$

∪ ∩ ∪

(−1) 0 ($\frac{1}{2}$) +1 (2)

(−)(−) (+)(−) (+)(+)

$(-\infty, 0)$ & $(1, +\infty)$ concave upward

$(0, 1)$ concave downward

49. $f(x) = x^3 - 2$

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

$f''(x) = 6x$

$6x = 0$

$x = 0$

∪ ∩

− − − − | + + + +

(−1) 0 (+1)

$f(0) = 0^3 - 2$

$f(0) = -2$

inflection pt. $(0, -2)$

$(0, -2)$

51. $f(x) = 6x^3 - 18x^2 + 12x - 20$

$f'(x) = 18x^2 - 36x + 12$

$f''(x) = 36x - 36$

$36x - 36 = 0$

$36(x-1) = 0$

$x = 1$

∪

(0) 1 (+2)

$f(1) = 6 - 18 + 12 - 20 = -20$

inflection point $(1, -20)$

Mr. Konichek
HMWK 4.2 cont.

4.2 cont. 52, 61, 77, 78

52. $g(x) = 2x^3 - 3x^2 + 18x - 8$

$g'(x) = 6x^2 - 6x + 18$

$g''(x) = 12x - 6$

$12x - 6 = 0$

$6(x-1) = 0$

$x = 1$

$\frown$ | $\smile$
(0) 1 (2)

$g(1) = 2 - 3 + 18 - 8$

$g(1) = 9$ inflection point $(1, 9)$

61. $f(x) = -x^2 + 2x + 4$

$f'(x) = -2x + 2$

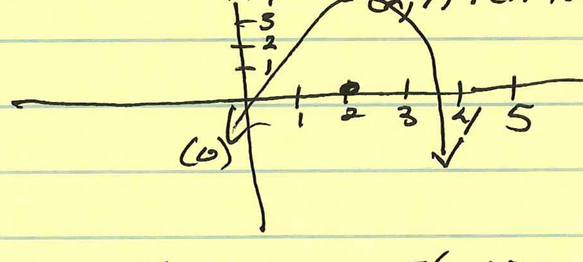
$-2(x-1) = 0$

$x = 1$ $f(1) = -1 + 2 + 4 = 5$

$\nearrow$ | $\searrow$
(0) 1 (6)

so $(1, 5)$ is a relative maximum

77. $f(2) = 4$, $f'(2) = 0$, $f''(x) < 0$ on $(-\infty, \infty)$




(2,4) relative maximum as $f''(x) < 0$ always sad face no inflection pt.

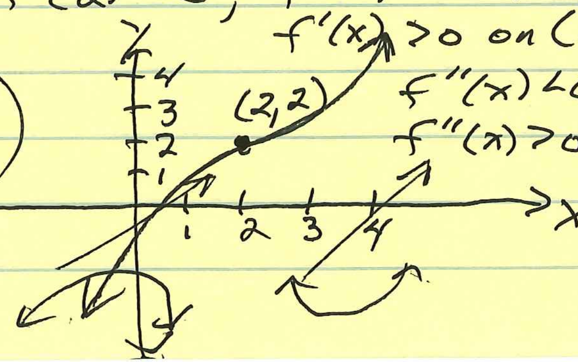
78. $f(2) = 2$, $f'(2) = 0$, $f'(x) > 0$ on $(-\infty, 2)$

$f'(x) > 0$ on $(2, \infty)$

$f''(x) < 0$ $(-\infty, 2)$

$f''(x) > 0$ $(2, \infty)$

(2, 2) is a critical pt. (NO EXTREMA)




so (2,2) also inflection pt.