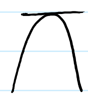
5.3 day 3

Monday, October 9, 2017 9:02 PM

pg. 221 # 31-34, 37, 41, 45, 46

To use the second derivative test, find when $y'=0$ and substitute x into y''.



$y'=0$ + concave down $\Rightarrow$ local max
$y''<0$

$y'=0$ + concave up $\Rightarrow$ local min
$y''>0$

31. $y = 3x - x^3 + 5$

$y' = 3 - 3x^2$

$y'' = -6x$

$3 - 3x^2 = 0$
$3 = 3x^2$
$\pm 1 = x$

$y''(-1) = 6 \Rightarrow$ local min at $(-1, 3)$ because $y'=0$ and $y''>0$

$y''(1) = -6 \Rightarrow$ local max at $(1, 7)$ because $y'=0$ and $y''<0$

32. $y = x^5 - 80x + 100$

$y' = 5x^4 - 80$

$y'' = 20x^3$

$5x^4 - 80 = 0$
$x^4 = 16$
$x = \pm 2$

$y''(-2) = -$ $\Rightarrow$ local max at $(-2, 228)$ because $y'=0$ and $y''<0$

$y''(2) = +$ $\Rightarrow$ local min. at $(2, -28)$ because $y'=0$ and $y''>0$

33. $y = x^3 + 3x^2 - 2$

$y' = 3x^2 + 6x$

$y'' = 6x + 6$

$3x^2 + 6x = 0$

$3x(x+2)=0$

$x=0,-2$

$y''(0)=6 \implies$ local min at $(0,-2)$ because $y'=0$ and $y''>0$

$y''(-2)=-6 \implies$ local max at $(-2,2)$ because $y'=0$ and $y''<0$

34. $y=3x^5-25x^3+60x+20$

$y'=15x^4-75x^2+60$

$y''=60x^3-150x$

$15x^4-75x^2+60=0$

$x^4-5x^2+4=0$

$(x^2-4)(x^2-1)=0$

$x=\pm 2, \pm 1$

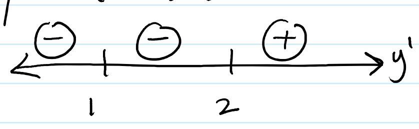
$y''(-2)=-\implies$ local max at $(-2,4)$ because $y'=0$ and $y''<0$

$y''(2)=+\implies$ local min at $(2,36)$ because $y'=0$ and $y''>0$

$y''(-1)=+\implies$ local min at $(-1,-18)$ because $y'=0$ and $y''>0$

$y''(1)=-\implies$ local max at $(1,58)$ because $y'=0$ and $y''<0$

37. $y'=(x-1)^2(x-2)$

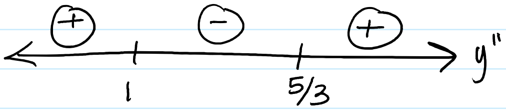


y has a local minimum at $x=2$ because y' changes from $-$ to $+$.

$y''=(x-1)^2\cdot 1+(x-2)\cdot 2(x-1)\cdot 1$

$=(x-1)\left[x-1+2(x-2)\right]$

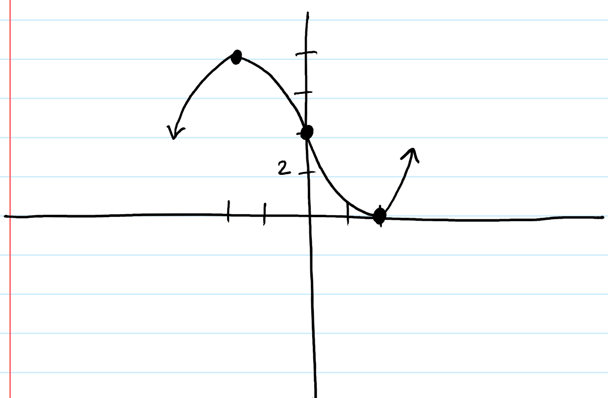
$=(x-1)(3x-5)$



y has points of inflection at $x = 1, 5/3$ because y'' changes from
(+) to (−) or from (−) to (+).

41. Not necessarily. We look for a sign change in f' to denote a local min or max. If no sign change in a continous function, then no extrema.

45.



46.