4.3 Cont:

Second Deriv. Test for local Extrema

1. If $f'(c)=0$ and $f''(c)<0$ then f has a local max at $x=c$.

2. If $f'(c)=0$ and $f''(c)>0$ then f has a local min at $x=c$

Ex: Find the local extreme values of $f(x) = x^3 - 12x - 5$

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

$f''(x) = 6x$

$f''(-2) = 6(-2) = -12$

$f''(2) = 6(2) = 12$

Crit #s:

$3x^2 - 12 = 0$

$x^2 = 4$

$x = \pm 2$

$f''(-2) < 0$, $\therefore f(x)$ has a local max @ $x = -2$.

$f''(2) > 0$, $\therefore f(x)$ has a local min @ $x = 2$

$y = x^5 - 80x + 100$ - Use Second Deriv test to find local extrema.

$y' = 5x^4 - 80$

$y'' = 20x^3$

Critical #s

$5x^4 - 80 = 0$

$x^4 = 16$

$x = \pm 2$

$f''(-2) = -$ local max

$f''(2) = +$ local min