MAT 160 – Spring 2011 – Professor Given
Summary of the Uses of the First and Second Derivatives

First Derivative	Second Derivative
Solving $f'(x)=0$ or dne gives critical numbers, the possible extrema	Solving $f''(x)=0$ or dne gives PPOI, the possible points of inflection
$f'>0 \Rightarrow f$ increasing $f'<0 \Rightarrow f$ decreasing	$f''>0 \Rightarrow f$ concave up $f''<0 \Rightarrow f$ concave down
A change in the sign of f' indicates an extrema	A change in the sign of f'' indicates a POI

First Derivative Test	Second Derivative Test
Gives a conclusion of max, min, or neither for **every** critical number	Can only give a conclusion of max or min for critical number satisfying both $f'(c)=0$ and $f''(c)\neq 0$
Substitute points to left and right of critical number: $-+ \Rightarrow$ min at $x=c$ $+- \Rightarrow$ max at $x=c$ $\left\{\begin{matrix}++\\--\end{matrix}\right\} \Rightarrow$ neither max nor min at $x=c$	Substitute critical number directly into f'' : $f''(c)>0 \Rightarrow$ min at $x=c$ $f''(c)<0 \Rightarrow$ max at $x=c$