MATH 241—THEORY HANDOUT
(Prof. Ross's sections)

THEOREM	*HYPOTHESES*	*CONCLUSION*
Bolzano	f continuous on $[a,b]$ $f(a) < 0 < f(b)$	$f(c) = 0$ for some $c \in (a,b)$
Intermediate Value Theorem *(I.V.T.)*	f continuous on $[a,b]$ $f(a) < d < f(b)$	$f(c) = d$ for some $c \in (a,b)$
Extreme Value Theorem	f is continuous on $[a,b]$	f attains a maximum and a minimum on $[a,b]$
Fermat's Theorem	f has a local maximum (or minimum) at $c \in (a,b)$ f differentiable at c	$f'(c) = 0$
Rolle	f continuous on $[a,b]$ f differentiable on (a,b) $f(a) = f(b)$	$f'(c) = 0$ for some $c \in (a,b)$
Mean Value Theorem *(M.V.T.)*	f continuous on $[a,b]$ f differentiable on (a,b)	$f'(c) = \frac{f(b)-f(a)}{b-a}$ for some $c \in (a,b)$

What you'll need to know:

(1) Statements and geometrical meanings of the results

(2) Applications, especially of Rolle and MVT

(3) Counterexamples when hypotheses are dropped
(e.g., problems such as §4.1 #53c,55 and §4.2# 5-9)

(4) For an extra credit problem, I might ask you to state and prove one of the following three theorems:
the Mean Value Theorem
Rolle's Theorem
Fermat's Theorem