Section 4.2

I. **Rolle's Theorem** *Let* f *be continuous on the closed bounded interval* $[a,b]$ *and differentiable on the open interval* (a,b)*. If* $f(a) = f(b)$*, then there exists at least one number c in between a and b such that* $f'(c) = 0$

a. Graphical Interpretation

b. Proof

II. **Mean Value Theorem** *Let* f *be continuous on the closed bounded interval* $[a,b]$ *and differentiable on the open interval* (a,b)*. There exists at least one number c in between a and b such that* $\dfrac{f(b)-f(a)}{b-a} = f'(c)$.

a. Graphical Interpretation

b. Proof

Examples

III. **Zero-Derivative Theorem** *Let* f *be continuous on the closed bounded interval* $[a,b]$ *and differentiable on the open interval* (a,b)*. If* $f'(x) = 0$ *for all* $x \in (a,b)$*, then* f *is a constant.*

a. Converse

IV. **Constant Difference Theorem** *Let* f *and* g *be continuous on the closed bounded interval* $[a,b]$ *and differentiable on the open interval* (a,b)*. If* $f'(x) = g'(x)$ *for all* $x \in (a,b)$*, then* $f - g$ *is a constant.*