List of Proofs for Exam 2

1. State and prove the **Rolle's Theorem**.
2. Use the **Rolle's Theorem** to prove the **Mean Value Theorem**.
3. Prove
   a. **Theorem 4.2.5:** If $f'(x) = 0$ for all x in an interval (a, b), then $f(x)$ is constant on (a, b).
   b. **Corollary 4.2.7:** If $f'(x) = g'(x)$ for all x in an interval (a, b), then $f - g$ is constant on (a, b); that is, $f(x) = g(x) + c$ were c is a constant.
4. Use the defintion of the *definite integral of $f(x)$ from a to b*,
$$\int_a^b f(x)\,dx = \lim_{n\to\infty} \sum_{i=1}^{n} f(x_i^*)\Delta x,$$
   to prove that
   a. $\displaystyle\int_a^b [f(x) + g(x)]\,dx = \int_a^b f(x)\,dx + \int_a^b g(x)\,dx$
   b. $\displaystyle\int_a^b cf(x)\,dx = c\int_a^b f(x)\,dx$
5. Use the **Fundamental Theorem of Calculus - Part I** to prove the **Fundamental Theorem of Calculus - Part II**. That is, if $f(x)$ is continuous on $[a, b]$, then
$$\int_a^b f(x)\,dx = F(b) - F(a)$$
   where $F(x)$ is any antiderivative of $f(x)$.