Class prep quiz on section 4.2, Stewart's Calculus (8th ed.)

1. Suppose f is a differentiable function (i.e., $f'(x)$ exists everywhere) such that $f(2) = 7$ and $f(8) = 3$. Which of the following statements **MUST** be true **because of the Mean Value Theorem**?
   (a) $f'(x) < 0$ for all values of x between 2 and 8.
   (b) $f'(5) = -\frac{2}{3}$.
   (c) The average rate of change of f between 2 and 8 is $-\frac{2}{3}$.
   (d) There is some value of x between 2 and 8 such that $f'(x) = -\frac{2}{3}$.

2. Let $f(x) = x^3 - 3x^2 + 6x + 10$. If we want to find the value(s) of x that satisfy the conclusion of the Mean Value Theorem on the interval $[-1, 3]$, what equation do we have to solve?
   (a) $3x^2 - 6x + 6 = 7$
   (b) $3x^2 - 6x + 6 = 0$
   (c) $x^3 - 3x^2 + 6x + 10 = 0$
   (d) $x^3 - 3x^2 + 6x + 10 = 7$

3. Suppose $f(x)$ is a differentiable function on the domain $[a, b]$. Which of the following statements must **ALWAYS** be correct?

   (I) If f is strictly increasing on $[a, b]$, then $f'(x) > 0$ whenever $a \leq x \leq b$.
   (II) If $f'(x) > 0$ whenever $a \leq x \leq b$, then f is strictly increasing on $[a, b]$.

   (a) Only I is always correct.
   (b) Only II is always correct.
   (c) Both I and II are always correct.
   (d) Neither I nor II is always correct.

4. Which of the following does **NOT** describe the relationship between Rolle's Theorem and the Mean Value Theorem, as applied to a differentiable function f on an interval $[a, b]$?

   (a) Rolle's Theorem and the Mean Value Theorem can tell you something different about the same differentiable function $f(x)$.

   (b) Rolle's Theorem can be used to prove the Mean Value Theorem.

   (c) In the statement of Rolle's Theorem, as compared to the Mean Value theorem, we make the additional assumption that the average rate of change of $f(x)$ on $[a, b]$ is 0.

   (d) Rolle's Theorem is the special case of the Mean Value Theorem where $f(a) = f(b)$.