DATE: _____

MVT AP Practice Problems

AP F/R Calculator Problem

t (hours)	$R(t)$ (gallons per hour)
0	9.6
3	10.4
6	10.8
9	11.2
12	11.4
15	11.3
18	10.7
21	10.2
24	9.6

1. The rate at which water flows out of a pipe, in gallons per hour, is given by a differentiable function R of time t. The table above shows the rate as measured every 3 hours for a 24-hour period. Is there some time t, $0 < t < 24$, such that $R'(t) = 0$? Justify your answer.

AP M/C Non-Calculator Problems

2. Let f be a polynomial function with degree greater than 2. If $a \neq b$ and $f(a) = f(b) = 1$, which of the following must be true for at least one value of x between a and b?

I. $f(x) = 0$
II. $f'(x) = 0$
III. $f''(x) = 0$

(A) None **(B)** I only **(C)** II only **(D)** I and II only **(E)** I, II, and III

3. Let f be a polynomial function where $f(b) > f(a)$. Which of the following is true for at least one value of x on the interval (a, b)?

I. The function f is differentiable on (a, b)
II. There exists a number k on (a,b) such that $f'(k) < 0$
III. There exists a number k on (a,b) such that $f'(k) > 0$

(A) I only **(B)** II only **(C)** I and II **(D)** I and III **(E)** I, II, and III

---

4. Which of the following statements is true for $f(x) = \sqrt[3]{x} + 1$?

I. $f(x)$ is always increasing, $x \neq 0$.
II. The tangent to the curve at $x = 0$ is horizontal.
III. The Mean Value Theorem can be applied to $f(x)$ in the closed interval $-1 \leq x \leq 1$.

(A) I only **(B)** II only **(C)** III only **(D)** II and III **(E)** I, II, and III

---

5. Find a positive value c, for x, that satisfies the conclusion of the Mean Value Theorem for Derivatives of $f(x) = 3x^2 - 5x + 1$ on the interval $[2,5]$.

(A) 1 **(B)** 13/6 **(C)** 11/6 **(D)** 23/6 **(E)** 7/2