Math 155 Worksheet 12

Name:
ID:

1. Verify that the function $f(x) = x + \frac{1}{x}$ satisfies The Mean Value Theorem on the interval $[1, 2]$, and find all the numbers c in the interval $(1, 2)$ that satisfy the conclusion of that theorem.

2. Apply Rolle's Theorem to explain why the equation $1+2x+x^3+4x^5 = 0$ has exactly one solution (Hint: Use the Intermediate Value property of Continuous functions to explain the equation has at least one solution. Then use Rolle's Theorem to explain the equation cannot have more than one solution.)

3. Sketch the graph of a function f with these properties: The domain of f is $(-\infty, \infty)$ and f', f'' exist on $(-\infty, \infty)$; $f'(0) = f'(2) = f'(4) = 0$, $f'(x) > 0$ on $(-\infty, 0) \cup (2, 4)$, $f'(x) < 0$ on $(0, 2) \cup (4, \infty)$, $f'' > 0$ on $(1, 3)$ and $f'' < 0$ on $(-\infty, 1) \cup (3, \infty)$. (Your graph should reflect all these features).

4. For each function f below,
(i) determine the open intervals where f is increasing and where it is decreasing,
(ii) find the local maximum and local minimum values of f,

(a) $f(x) = 2x^3 + 3x^2 - 36x$.

(b) $g(x) = x^{1/3} - x^{2/3}$.

(c) $h(x) = 2\sin(x)\cos(x)$ on $(-\pi/2, \pi/2)$.

(d) $p(x) = x^3 - \dfrac{48}{x}$.