MAT 201
Assignment 9
Thursday, April 16, 2015

For full credit on these problems, each must be submitted with a complete and clear solution, showing all of your work. You may work with other classmates on these problems, but please indicate on your assignment if you received help. Partial answers and incomplete solutions may be eligible for some partial credit, depending on the level of completeness and demonstrated understanding.

1. Find the absolute extrema of the following functions on the closed interval given.
   (a) $f(x) = 2x^3 - 6x$ on $[0, 3]$.
   (b) $f(x) = -3x\sqrt{x+1}$ on $[-1, 1]$.
   (c) $f(x) = e^x \sin x$ on $[0, \pi]$.
   (d) $V(x) = x(14 - 2x)(20 - 2x)$ on $[0, 7]$.

2. Draw a graph of a function with the following properties:
   - Relative minimum at $x = -1$
   - Crtical number(but no extremum) at $x = 0$
   - Absolute maximum at $x = 2$
   - Absolute minimum at $x = 5$

3. Determine whether Rolle's Theorem can be applied to $f(x) = \sin x$ on the interval $[0, 2\pi]$. If it can be applied, find c in the interval $(0, 2\pi)$ such that $f'(c) = 0$. If it cannot be applied, explain why.

4. Determine whether the Mean Value Theorem can be applied to $f(x) = x^4 - 8x$ on the interval $[0, 2]$. If the Mean Value Theorem can be applied, find all values of c in the interval $(0, 2)$ such that
$$f'(c) = \frac{f(2) - f(0)}{2 - 0}.$$

5. The height of an object t seconds after it is dropped from a height of 300 meters is
$$s(t) = -4.9t^2 + 300.$$
   (a) Find the average velocity of the object during the first 3 seconds.
   (b) Use the Mean Value Theorem to verify that at some time during the first 3 seconds of fall, the instantaneous velocity equals the average velocity.
   (c) Find the time refered to in part (b).