MATH 14 LAB 3B3 Fall 2011

Lab Quiz 8   Name: _____

Show all work clearly and in order, and circle your final answers.
Justify your answers algebraically whenever possible.

1. (*2 points*) True or false?

A.) The following statement is a direct application of the Mean Value The-
orem: If f is continuous and differentiable on $[a, b]$ and $f(a) = f(b)$ then
there exists a real number c such that $a < c < b$ and $f'(c) = 0$.

B.) The following statement is a direct application of Rolle's Theorem: If
f is continuous and differentiable on $[a, b]$, then there exists a real number
c such that $a < c < b$ and $f'(c) = \frac{f(b) - f(a)}{b - a}$.

2. (*2 points*) Find the critical number(s) of $f(x) = x^2 + 3x + 1$.

3. (*2 points*) You are in your car driving along a long, straight road. Your car's position at time t (measured in HOURS) happens to be given by a continuous, differentiable function $f(t)$ (note: this is a reasonable and realistic assumption!), where $f(t)$ is measured in miles.

Danger! At time $t = t_1$, you car has travelled 5 miles (so $f(t_1) = 1$), there is a police radar station that checks your speed and records the time you pass it. Luckily you drive this road often and know to go the speed limit near the radar station, so they do not pursue you.

There is another radar station 140 miles from your starting point, which you reach at time $t = t_2$ (that is, $f(t_2) = 80$) which also checks your speed and records the time you pass it. Luckily you knew it was coming and you *made sure you went the speed limit near the second station*!

The speed limit on this road is $30\frac{mi}{hr}$. Suppose you passed the first radar station at 5:10 PM (this means $t_1 =$ 5:10 PM) and the second radar station at 8:10 PM. After you pass the second station, the police pull you over and issue a ticket for speeding.

The police did not observe you speeding but still issued you a ticket. Is issuing a ticket justified (according to the law... not your opinion of speed limits)? Why or why not?

(Note: In some legal jurisdictions, issuing a ticket without directly observing the offending behavior would be illegal! Consider for example California Vehicle Code Division 17 Chapter 3 Article 1 Section 40802 and Section 40803... assume for this problem it is legal for the police to do this.)