Math 180 Worksheet 2 Partial Solutions

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Problem (2). One way to quickly do each of these computations is to note that $p(t) = t^2 - t$, and so for the interval $[1, a]$ the slope(average velocity) is supposed to be,

$$\frac{p(a) - p(1)}{a - 1} = \frac{a^2 - a}{a - 1} = a.$$

Now we know! for intervals $[1, 1.5]$ the answer is 1.5, for $[1, 1.001]$ the answer is 1.001. And when your a gets really close to 1, the instantaneous velocity can be taken as 1. $\square$

Problem (3). (a) and (b) are pretty simple. The answers turn out to be some 72 mph for (a) and 90 mph, 51.43 mph for (b).

Onto part (c), there are many ways that Olive's argument fails. For the first thing, average velocity does not give any information about the instantaneous velocity. So even if her average velocity over the second half is 51.43 which is less than 60, we are only concerned about her speed at the instant she crossed the checkpoint. We don't know much about that!

And finally, even if we trusted her argument, over the first half, the speed limit was 90 mph. Suppose she drove her car at full speed (being the lawful citizen she is, she didn't cross the speed of 90 mph at any instant, right?). In that case, the distance that she could have covered in 1 minute and 20 seconds is exactly 2 miles. If her speed had dropped below 90 at any time, she couldn't have covered those full 2 miles. So, her speed anyway during the checkpoint was 90, greater than 60.

Her own argument proved her guilty! $\square$

Food for thought. What would have been the answer to 3(c) above, had the speed limit for the first two miles been 100 mph?