MATH 110 Problem Set 1.4 Solutions

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1. (a) We can answer this question with the following table, in which the interval I has endpoints t_0 and t_1. For example, when the time interval I is $[1, 1.1]$ we have $t_0 = 1$ and $t_1 = 1.1$.

I	$s(t_1)$	$s(t_0)$	Δs	Δt	V
$[1, 2]$	12.5600	8.14	4.42	1	4.42
$[1, 1.5]$	10.8150	8.14	2.675	0.5	5.35
$[1, 1.1]$	8.7494	8.14	0.6094	0.1	6.094
$[1, 1.01]$	8.2026	8.14	0.0626	0.01	6.261
$[1, 1.001]$	8.1463	8.14	0.006278	0.001	6.278

   (b) Based on the above table, we might estimate that the instantaneous velocity of the ball is something like 6.28 m/s when $t = 1$.

2. This is similar to the previous question, with t replaced by x, s replaced by y, and the average velocity replaced with the slope of the secant line, i.e.,

$$m = \frac{\Delta y}{\Delta x} = \frac{y(x) - y(3)}{x - 3}$$

   (a) We have the following table of values.

x	$y(x)$	$y(3)$	Δy	Δx	m
3.1	1.0488	1	0.0488	0.100	0.4880
3.01	1.0050	1	0.0050	0.010	0.4988
3.001	1.0005	1	0.0005	0.001	0.4999
2.999	0.9995	1	-0.0005	-0.001	0.5001
2.99	0.9950	1	-0.0050	-0.010	0.5013
2.9	0.9487	1	-0.0513	-0.100	0.5132

   (b) Based on the table, a reasonable guess for the slope of the tangent line would be 0.5000. We'll learn later that that is the correct answer.