MATH 133 – Calculus with Fundamentals 1
Problem Set 3B Solutions, September 29, 2017

Section 2.1

2. Construct a table like the one given in Problem 1. With $s(t) = 4.9t^2$,

Interval	$[3, 3.1]$	$[3, 3.01]$	$[3, 3.001]$	$[3, 3.0001]$
Ave.vel.	29.89	29.449	29.4049	29.4005

From this we guess the instantaneous velocity at $t = 3$ is about 29.4.

40.

(a) The units of the rate of change are seconds/meter. This measures how fast the period is changing as the length of the pendulum increases.

(b) The slope of line A (the tangent line) represents the instantaneous rate of change of the period with respect to the length when the length is 3 meters. The slope of line B (the secant line) represents the average rate of change of the period as a function of the length, over the interval Length in $[1, 3]$.

(c) From the formula $T = \frac{3}{2}\sqrt{L}$ given in the problem, we compute a table of values for the average rates of change

Interval	$[3, 3.1]$	$[3, 3.01]$	$[3, 3.001]$	$[3, 3.0001]$
Ave.	.4296	.4327	.4330	.4330

It looks as though the limit is about .4330. The average rates of change over intervals ending at $L = 3$ would be tending to the same value.

Section 2.2

5. It seems that $\lim_{x\to 0.5} f(x) = 1.5$ since the y-coordinates are tending to that value as x tends to 0.5 from both sides.

6. It seems that $\lim_{x\to 0.5} f(x) = 1.5$ since the y-coordinates are tending to that value as x tends to 0.5 from both sides. Unlike the picture in 5, this function has $f(0.5) = 1 \neq 1.5$. That does not affect the limit.

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At $x = 1$, $\lim_{x\to 1^-} f(x) = 3$ and $\lim_{x\to 1^+} f(x) = 1$. This implies $\lim_{x\to 1} f(x)$ *does not exist* (the one-sided limits are not equal).

At $x = 2$, the situation is similar. $\lim_{x\to 2^-} f(x) = 2$ and $\lim_{x\to 2^+} f(x) = 1$, so $\lim_{x\to 1} f(x)$ *does not exist* (the one-sided limits are not equal).

At $x = 4$ both one-sided limits exist and equal 2, so $\lim_{x\to 4} f(x) = 2$.