

**LB 118, Sections 009 & 010, Fall 2015**  
**Homework 1 (due 9/11)**

**Instructions:** Please write your solutions to the problems below on a clean piece of paper (not this piece of paper). You will not need more than one page (front and back) to write your answers. Show the steps taken to arrive at each answer. Do not include scratch work, doodles, scribbles, crossed out work, etc.; instead, carefully write your solutions after you have figured out the answers and checked them over.

1. Suppose that the distance that a train has moved away from a train station is given by the function  $D(t)$ , where the distance  $D(t)$  is measured in feet and the time  $t$  is measured in minutes. Use the chart below to answer the questions below.

$D(t)$	0	200	300	410	429	450
$t$	0	1	1.5	1.9	1.95	2

- (a) What is the average velocity of the train over the time interval  $0 \leq t \leq 2$ ? Give the correct units.
- (b) Determine the best estimate of the instantaneous velocity of the train when  $t = 2$  based on the information given above. Simplify your answer as much as possible.
- (c) Express the instantaneous velocity of the train at  $t = 2$  as a limit of an expression involving  $D(t)$ .
- (d) Is the train accelerating or decelerating during the time interval  $0 \leq t \leq 2$ ? Explain your reasoning.

2. Let  $f(x) = \sqrt{x-1}$  and  $g(x) = \frac{1}{1-x}$ .

- (a) Evaluate  $(f \circ g)(x)$ . Simplify the resulting expression by writing it as a single fraction.
- (b) What is the domain of  $f \circ g$ ? Write your answer using interval notation.
- (c) Evaluate  $(g \circ f)(x)$ . Simplify the resulting expression by rationalizing the denominator.
- (d) What is the domain of  $g \circ f$ ? Write your answer using interval notation.