

## Quiz # 2 [SOLUTION] for MA 113 - Calculus I

January 28, 2009

This quiz is intended to help you prepare for the exams. Thus, you should attempt all questions and write your answers (including your explanations) in the space provided.

This quiz will not be collected or graded.

1. (modified from Exam 1, question 6, Spring 2009) A particle is moving on a straight line so that its position after  $t$  seconds is given by  $s(t) = 4t^2 - t$  meters. Find the average velocity of the particle over the time interval  $[1, 2]$ .

$$\text{average velocity} = \frac{\text{distance traveled}}{\text{time elapsed}} = \frac{s(2) - s(1)}{2 - 1} = \frac{(4 \cdot 2^2 - 2) - (4 \cdot 1^2 - 1)}{2 - 1} = \frac{14 - 3}{1} = 11$$

2. (modified from Stewart, page 98, question 12) Given:

$$f(x) = \begin{cases} 2 - x & \text{if } x < -1 \\ x & \text{if } -1 \leq x < 1 \\ (x - 1)^2 & \text{if } x \geq 1 \end{cases}$$

(a) Find  $\lim_{x \rightarrow 1^+} f(x)$ .      Answer (a):  $\lim_{x \rightarrow 1^+} f(x) = \lim_{x \rightarrow 1^+} (x - 1)^2 = (1 - 1)^2 = 0$

(b) Find  $\lim_{x \rightarrow 1^-} f(x)$ .      Answer (b):  $\lim_{x \rightarrow 1^-} f(x) = \lim_{x \rightarrow 1^-} x = 1$

(c) Does  $\lim_{x \rightarrow 1} f(x)$  exist?      Answer (c): No, because  $\lim_{x \rightarrow 1^+} f(x) = 0 \neq 1 = \lim_{x \rightarrow 1^-} f(x)$ .

(d) Find  $\lim_{x \rightarrow -1^+} f(x)$       Answer (d):  $\lim_{x \rightarrow -1^+} f(x) = \lim_{x \rightarrow -1^+} x = -1$

(e) Find  $\lim_{x \rightarrow -1^-} f(x)$       Answer (e):  $\lim_{x \rightarrow -1^-} f(x) = \lim_{x \rightarrow -1^-} 2 - x = 2 - (-1) = 3$

(f) Does  $\lim_{x \rightarrow -1} f(x)$  exist?      Answer (f): No, because  $\lim_{x \rightarrow -1^+} f(x) = -1 \neq 3 = \lim_{x \rightarrow -1^-} f(x)$ .

(g) What is the value of  $f(1)$ ?      Answer (g):  $f(1) = (1 - 1)^2 = 0$

(h) What is the value of  $f(-1)$ ?      Answer (h):  $f(-1) = -1$