

Name: \_\_\_\_\_.

MATH 115 - SEC 011, WINTER 2011. QUIZ 3  
TIME LIMIT: 15 MINUTES

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Good luck!

**Problem 1**

For each problem below, find a value of the constant  $k$  such that the limit exists. Show your reasoning.

- $\lim_{x \rightarrow 4} \frac{x^2 - k^2}{x - 4}$

- $\lim_{x \rightarrow 1} \frac{x^2 - kx + 4}{x - 1}$

- $\lim_{x \rightarrow \infty} \frac{x^2 + 3x + 5}{4x + 1 + x^k}$

**Problem 2** In a time of  $t$  in seconds, a particle moves a distance of  $s$  meters from its starting point, where  $s = 4t^2 + 3$ . **Include units.**

(a) Find the average velocity between  $t = 1$  and  $t = 1 + h$  if

(i)  $h = 0.1$

(ii)  $h = 0.01$

(iii)  $h = 0.001$

(b) Use your answer to part (a) to estimate the instantaneous velocity of the particle at time  $t = 1$ .

**Problem 3**

(a) Sketch the graph of a continuous function  $f$  with all of the following properties:

(i)  $f(0) = 2$

(ii)  $f(x)$  is decreasing for  $0 \leq x \leq 3$

(iii)  $f(x)$  is increasing for  $3 < x \leq 5$

(iv)  $f(x)$  is decreasing for  $x > 5$

(v)  $f(x) \rightarrow 9$  as  $x \rightarrow \infty$

(b) Is it possible that the graph of  $f$  is concave down for all  $x > 6$ ? Explain