

**Math 141**  
**Assessment of**  
**Stds L1–L5**

**Instructions:** Write out solutions to these questions using complete sentences to explain your work. You may use your book and the internet as long as it does not solve the problem for you. You may **NOT** consult with other people. Remember you are convincing me that you understand the concepts, not simply giving me “the answer”. Bring your work to class on Monday, October 18.

**L1.** Give an example of a limit that does not exist. Explain in a paragraph or two why the limit does not exist. You should appeal to the definition of a limit given on page 25, and not the formal definition given on page 31.

**L2.** Compute the following two limits with appropriate justification and notation.

(a)  $\lim_{x \rightarrow 2} \frac{x^2 - 4x + 4}{x^2 - 4}$ .

(b)  $\lim_{x \rightarrow 0} \frac{\sin 4x}{7x}$ .

**L3.** Prove that the following function is continuous **everywhere**. Simply showing that it is continuous at one number is not sufficient.

$$f(x) = \begin{cases} \sqrt{-x+4} & \text{if } x < 0 \\ 2 - x^2 & \text{if } x \geq 0 \end{cases}$$

**L4.** Determine the vertical and horizontal asymptotes of the following function using limits. For each vertical asymptote determine the behavior of the function on either side. Is the limit  $+\infty$ ,  $-\infty$ , or something else? Explain your reasoning.

$$g(x) = \frac{x}{1-x}$$

**L5.** There are two different limits of difference quotients that give us the derivative of a function at a number  $a$ . Write them both down and explain why—even though they look different—they are performing the exact same calculation.