

MAT 241 Section 07 Fall 2009

Problem Set 3

Assigned 9/14/09

Due 9/21/09

1. Explain in your own words what is meant by the equation:

$$\lim_{x \rightarrow 2} f(x) = 5$$

Is it possible for this statement to be true and yet $f(2) = 3$? Explain.

2. Explain what it means to say:

$$\lim_{x \rightarrow 1^-} f(x) = 3 \quad \text{and} \quad \lim_{x \rightarrow 1^+} f(x) = 7$$

In this situation is it possible that $\lim_{x \rightarrow 1} f(x)$ exists? Explain.

3. Explain the meaning of each of the following:

$$\text{a. } \lim_{x \rightarrow -3} f(x) = \infty \quad \text{b. } \lim_{x \rightarrow 4^+} f(x) = -\infty$$

7. For the function g whose graph is given in 2.2.7.png, state the value of each quantity, if it exists. If it does not exist, explain why.

$$\begin{array}{lll} \text{a. } \lim_{t \rightarrow 0^-} g(t) & \text{b. } \lim_{t \rightarrow 0^+} g(t) & \text{c. } \lim_{t \rightarrow 0} g(t) \\ \text{d. } \lim_{t \rightarrow 2^-} g(t) & \text{e. } \lim_{t \rightarrow 2^+} g(t) & \text{f. } \lim_{t \rightarrow 2} g(t) \\ \text{g. } g(2) & \text{h. } \lim_{t \rightarrow 4} g(t) & \end{array}$$

9. For the function f whose graph is given in 2.2.9.png, state the following.

$$\begin{array}{lll} \text{a. } \lim_{x \rightarrow -7} f(x) & \text{b. } \lim_{x \rightarrow -3} f(x) & \text{c. } \lim_{x \rightarrow 0} f(x) \\ \text{d. } \lim_{x \rightarrow 6^-} f(x) & \text{e. } \lim_{x \rightarrow 6^+} f(x) & \end{array}$$

- f. Give the equations of the vertical asymptotes.

12. Sketch the graph of the following function and use it to determine the values of a for which $\lim_{x \rightarrow a} f(x)$ exists:

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

13. Sketch the graph of an example of a function f that satisfies all of the following conditions:

$$\lim_{x \rightarrow 1^-} f(x) = 2 \quad \lim_{x \rightarrow 1^+} f(x) = -2 \quad f(1) = 2$$

21. Use a table of values to estimate the value of the limit. If you have a graphing device, use it to confirm your result graphically.

$$\lim_{x \rightarrow 0} \frac{\sqrt{x+4} - 2}{x}$$

23. Use a table of values to estimate the value of the limit. If you have a graphing device, use it to confirm your result graphically.

$$\lim_{x \rightarrow 1} \frac{x^6 - 1}{x^{10} - 1}$$

25. Determine the value of the infinite limit:

$$\lim_{x \rightarrow -3^+} \frac{x+2}{x+3}$$

26. Determine the value of the infinite limit:

$$\lim_{x \rightarrow -3^-} \frac{x+2}{x+3}$$