Name_____ Date_____ Period_____

Worksheet 3.1—Limits

Show all work. Unless stated otherwise, no calculator permitted.

1. Explain in your own words what is meant by the equation $\lim_{x\to 2} f(x) = 4$. Is it possible for this statement to be true and yet $f(2) = 5$? Explain. What graphical feature would be manifested in this situation?

2. Explain what it means to say that $\lim_{x\to 1^-} f(x) = 3$ and $\lim_{x\to 1^+} f(x) = 6$.

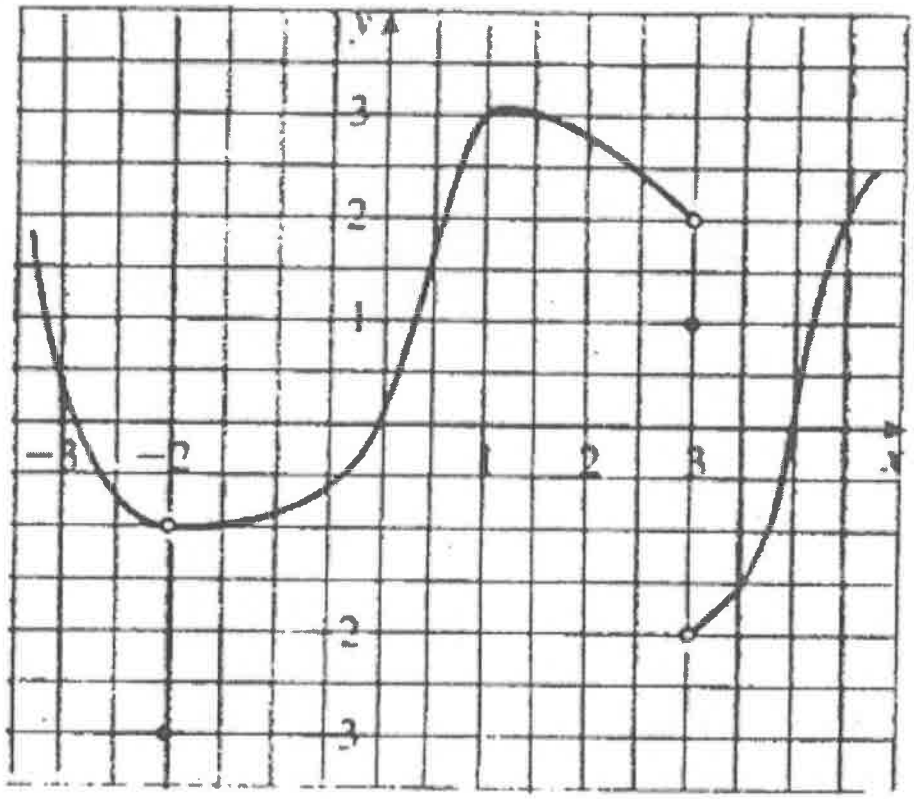
   In this situation, is it possible that $\lim_{x\to 1} f(x)$ exists? Explain. What graphical feature would be manifested in this situation?

3. Explain the meaning of each of the following, then sketch a graph of a function exhibiting the indicated behavior.

   (a) $\lim_{x\to -2} f(x) = \infty$

   (b) $\lim_{x\to -3^+} g(x) = -\infty$.

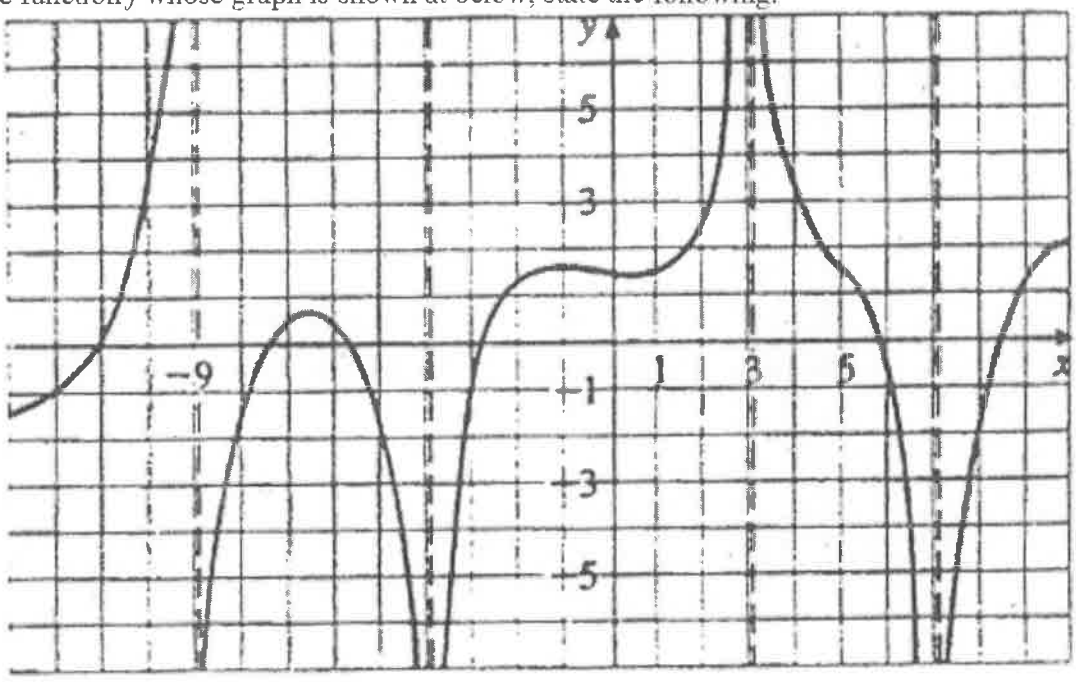
4. For the function f whose graph is given at below, state the value of the given quantity, if it exists. If it does not exist, explain why.



(a) $\lim_{x\to 1} f(x) =$ (b) $\lim_{x\to 3^-} f(x) =$ (c) $\lim_{x\to 3^+} f(x) =$ (d) $\lim_{x\to 3} f(x) =$

(e) $f(3) =$ (f) $\lim_{x\to -2^-} f(x) =$ (g) $\lim_{x\to -2^+} f(x) =$ (h) $\lim_{x\to -2} f(x) =$ (i) $f(-2) =$

5. For the function f whose graph is shown at below, state the following.

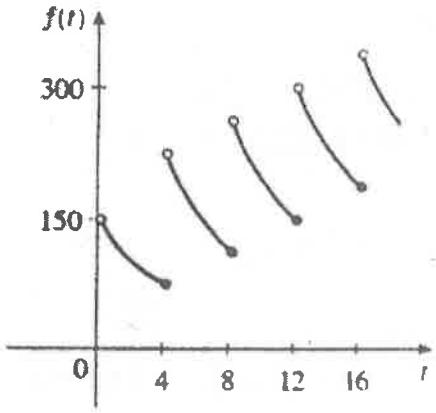


(a) $\lim_{x\to 3} f(x) =$ (b) $\lim_{x\to 7} f(x) =$ (c) $\lim_{x\to -4} f(x) =$

(d) $\lim_{x\to -9^-} f(x) =$ (e) $\lim_{x\to -9^+} f(x) =$ (f) $\lim_{x\to -9} f(x) =$

(g) The equations of the vertical asymptotes

6. A patient receives a 150-mg injection of a drug every four hours. The graph at right shows the amount $f(t)$ of the drug in the bloodstream after t hours. Find $\lim_{t\to 12^-} f(t)$ and $\lim_{t\to 12^+} f(t)$ and then explain the significance/meaning of these one-sided limits in terms of the injections.



7. (**Calculator Permitted**) Sketch the graph of the function $f(x)=\dfrac{1}{1+2^{1/x}}$ and state the value of each limit, if it exists. If it does not exist, explain why. State any discontinuities.

(a) $\lim\limits_{x\to 0^-} f(x)=$ (b) $\lim\limits_{x\to 0^+} f(x)=$ (c) $\lim\limits_{x\to 0} f(x)=$ (d) $f(0)=$

8. Sketch the graph of the following function, and use it to help you determine the values of a for which $\lim\limits_{x\to a} f(x)$ exists. Describe any discontinuities.

$$f(x)=\begin{cases}2-x, & x<-1\\ x, & -1\le x<1\\ (x-1)^2, & x\ge 1\end{cases}$$

9. (Calculator permitted) Fill in the table for the following function, then use the numerical evidence to evaluate the indicated limit. (Be sure you're in radian mode)

$f(x)=\dfrac{\sin(3x)}{x}=$

x	−0.1	−0.01	−0.001	0	0.001	0.01	0.1
$f(x)$							

10. (Calculator permitted) Fill in the table for the following function, then use the numerical evidence to evaluate the indicated limit.

$f(x)=\dfrac{1-\cos x}{x^2}=$

x	−0.1	−0.01	−0.001	0	0.001	0.01	0.1
$f(x)$							