CALCULUS
WORKSHEET 1 ON LIMITS

1. Explain in your own words what is meant by the equation
$$\lim_{x \to 2} f(x) = 5.$$

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

2. Explain what it means to say that
$$\lim_{x \to 1^-} f(x) = 3 \text{ and } \lim_{x \to 1^+} f(x) = 7.$$

   In this situation, it is possible that $\lim_{x \to 1} f(x)$ exists?

3. Explain the meaning of each of the following.
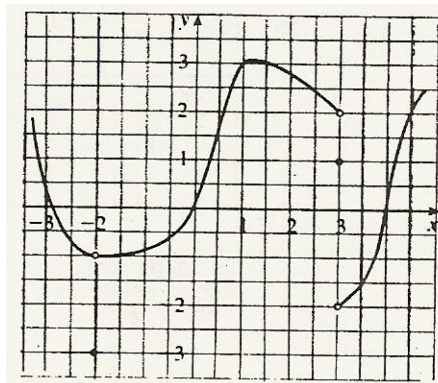   (a) $\lim_{x \to -3} f(x) = \infty$

   (b) $\lim_{x \to 4^+} f(x) = -\infty$

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4. For the function f whose graph is given, 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) $\lim_{x \to -2^-} f(x) =$

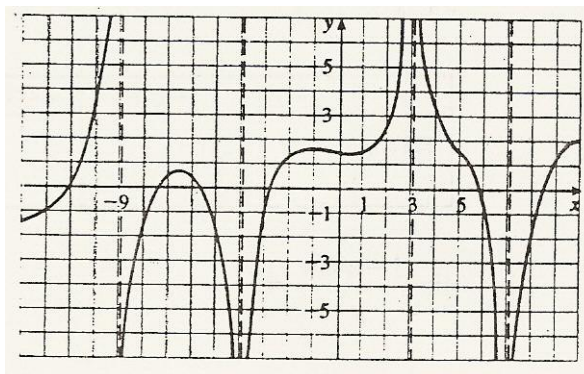   (g) $\lim_{x \to -2^+} f(x) =$ (h) $\lim_{x \to -2} f(x) =$ (i) $f(-2) =$

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5. For the function f whose graph is shown, 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) $\lim_{x \to -9^+} f(x) =$
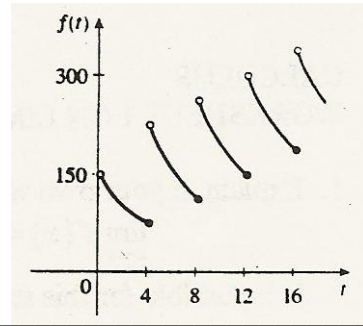
   (f) The equations of the vertical asymptotes

TURN--->>>

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

7. Sketch the graph of the function $f(x) = \dfrac{1}{\left(1 + 2^{1/x}\right)}$ and state

the value of each limit, if it exists. If it does not exist, explain why.

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

8.

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

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

Fill in the table for the following functions to find the given limit.

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

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

$$\lim_{x \to 0} \frac{\sin(3x)}{x} =$$

10. $g(x) = \dfrac{1 - \cos x}{x^2}$

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
$g(x)$							

$$\lim_{x \to 0} \frac{1 - \cos x}{x^2} =$$