

1) Find the value of the limit:  $\lim_{x \rightarrow 2} \frac{x^3 - 8}{x - 2}$ . **Show your work.**

2) Find the value of the limit:  $\lim_{x \rightarrow 2^+} \frac{|x - 2|}{x - 2}$ . **Show your work.**

3) Find the value of the limit:  $\lim_{x \rightarrow 1} \frac{x - 1}{\sqrt{x} - 1}$ . **Show your work.**

4) Find the value of the limit:  $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x^2 - 5x + 6}$ . **Show your work.**

5) For all but two choices of  $a$ , the function  $f(x) = \begin{cases} x^3, & \text{if } x \leq a \\ x^2, & \text{if } x > a \end{cases}$  will be *discontinuous* at the point  $x = a$ . For what values of  $a$  will  $f(x)$  be *continuous* at  $x = a$ ?

6) At what value(s) of  $x$  is the function  $f(x) = \begin{cases} x + 2, & \text{if } x \leq -1 \\ x^2, & \text{if } -1 < x < 1 \\ 3 - x, & \text{if } x \geq 1 \end{cases}$  discontinuous?

- a)  $-1$    b)  $0$    c)  $1$    d)  $-1, 0$   
e)  $0, 1$    f)  $-1, 1$    g)  $-1, 0, 1$   
h) continuous *everywhere*

7) Use the graph below to find the indicated quantities:

a)  $\lim_{x \rightarrow -1^-} f(x) =$

b)  $\lim_{x \rightarrow -1} f(x) =$

c)  $\lim_{x \rightarrow 1^-} f(x) =$

d)  $\lim_{x \rightarrow 2^+} f(x) =$

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

f)  $f(-1) =$

g)  $f(1) =$

8) Make an appropriate table to determine the limit:  $\lim_{x \rightarrow 0} \frac{\cos x - 1}{x}$ .

9) Complete the following:

a) **Theorem:**  $\lim_{x \rightarrow a} f(x) = L$  iff  $\lim_{x \rightarrow a^-} f(x) = L$  and \_\_\_\_\_.

b) **Squeeze Theorem:** If  $f(x) \leq g(x) \leq h(x)$  when  $x$  is near  $a$  (except possibly at  $a$ ) and if

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$$\text{then } \lim_{x \rightarrow a} g(x) = L.$$

c) **Continuity:** A function  $f$  is *continuous* at a number  $a$  if

$$\lim_{x \rightarrow a} f(x) = \text{_____}.$$

d) **Intermediate Value Theorem:** Suppose that  $f$  is continuous on the closed interval  $[a, b]$  and let  $N$  be any number strictly between  $f(a)$  and  $f(b)$ . Then there exists a number  $c$  in  $(a, b)$  such that \_\_\_\_\_.

10) Consider the following function:  $f(x) = \begin{cases} \sqrt[3]{x}, & \text{if } x < 0 \\ x^2, & \text{if } 0 < x < 4 \\ 32 - 4x, & \text{if } x \geq 4 \end{cases}$

a) What is the domain of  $f$  ?

b) What is the range of  $f$  ?

c) Where, if at all, is  $f$  **discontinuous** ?