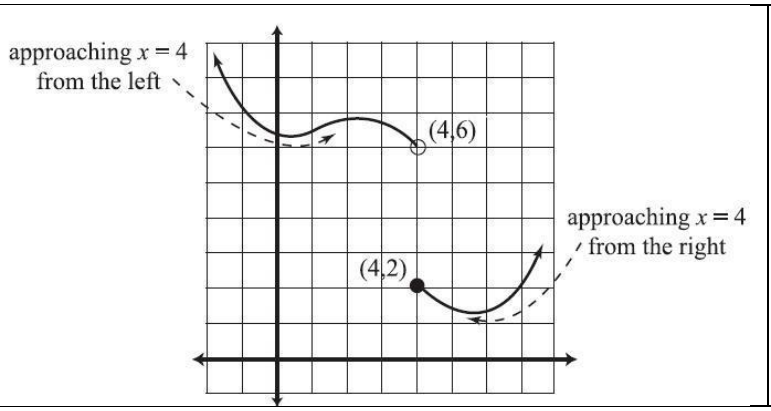
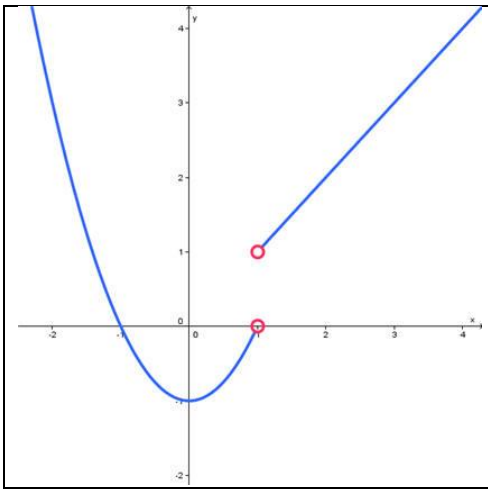
Sec. 2.3 Limits and Continuity (LoC) Name_____



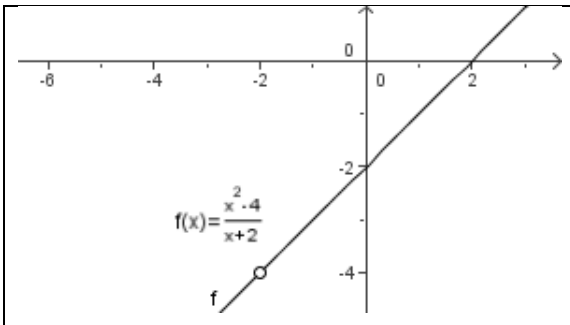
1. What is the value of the function at x=4?
   f(4)=_____.
2. What is the limit of the function at the point x=4, approaching from the left?
   $\lim_{x\to 4^-} f(x) =$ ____
3. What is $\lim_{x\to 4^+} f(x) =$_____
4. What is $\lim_{x\to 4} f(x) =$_____

Q. *Can a function exist at a point at which the limit of the function at that point does not exist?*_____.



1. What is the value of the function at x=1?
   f(1)=_____.
2. What is the limit of the function whose graph is shown at the point x=1, approaching from the left?
   $\lim_{x\to 1^-} f(x) =$ ____
3. What is $\lim_{x\to 1^+} f(x) =$_____
4. What is $\lim_{x\to 1} f(x) =$_____

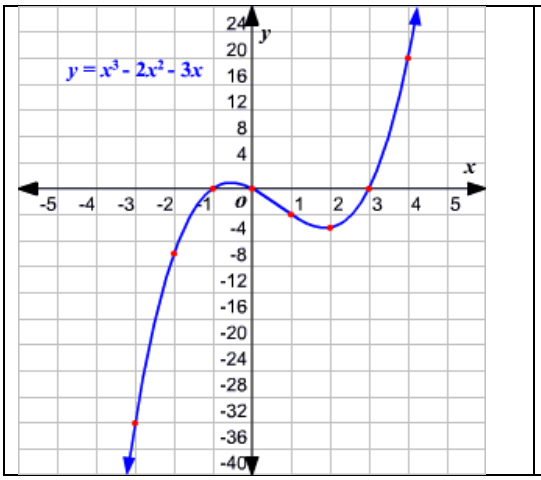
Q. *Is it possible that a function may not be defined at a point at which the limit of the function is also not defined? (i.e. both do not exist at that point)*_____.



1. What is the value of the function at x=-2?
   f(-2)=_____.
2. What is the limit of the function whose graph is shown at the point x=-2, approaching from the left?
   $\lim_{x\to -2^-} f(x) =$ ____
3. What is $\lim_{x\to -2^+} f(x) =$_____
4. What is $\lim_{x\to -2} f(x) =$_____

Q. *Can the limit of a function exist at a point at which the function does not exist? EXPLAIN*_____

**Verify algebraically the above graph of the function given.



1. What is the value of the function at x=-1, 0, 1?
   f(-1)=_____, f(0)=_____, f(1)=_____

2. What is the limit of the function whose graph is shown at the point x=1, approaching from the left?
   $\lim_{x\to 1^-} f(x) =$____

3. What is $\lim_{x\to 1^+} f(x) =$_____

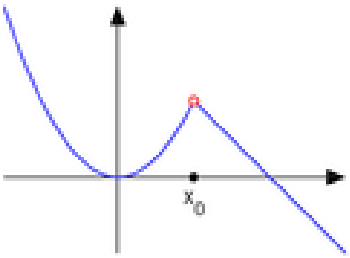
4. What is $\lim_{x\to 1} f(x) =$_____

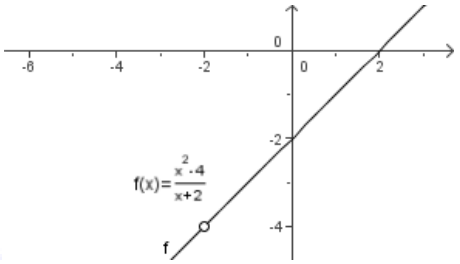
What do you notice about the value of the FUNCTION at x=1 and the value of the limit of the function at x=1?

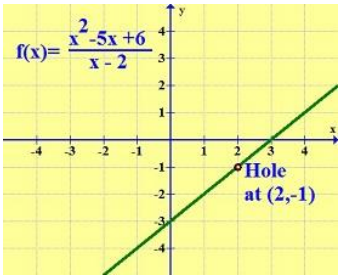
Q. *What do you notice about the graph of a function at a point where the value of the function and the value of the limit of the function <u>are the same</u> ?*_____. This is an example of a **continuous function.** Informally stated, a continuous function has no "breaks" in its graph.

Removable discontinuities:

Suppose we are given permission to "fix" a function at a point where it is not too badly "broken," but only by defining or by redefining the function at ONE single point. Such a function is said to have a *removable discontinuity*(a "hole" discontinuity is such an example*).* Which functions below have removable discontinuities? Redefine the functions to remove the discontinuity.







Summary:

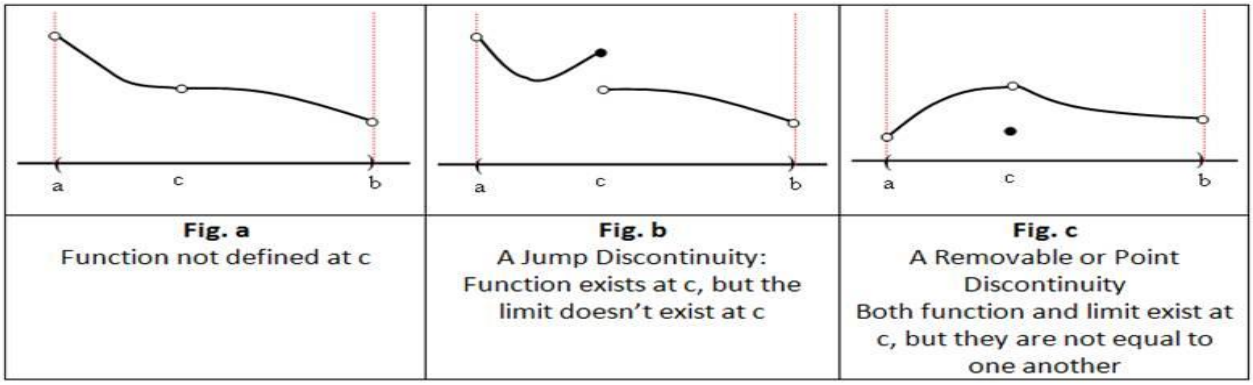
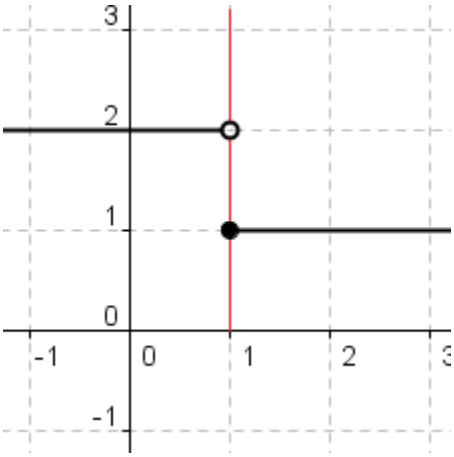
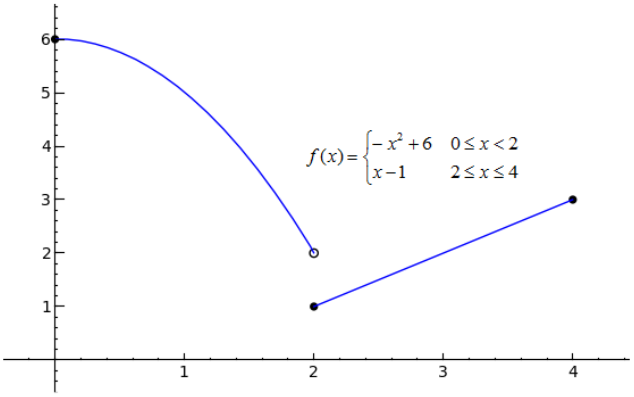
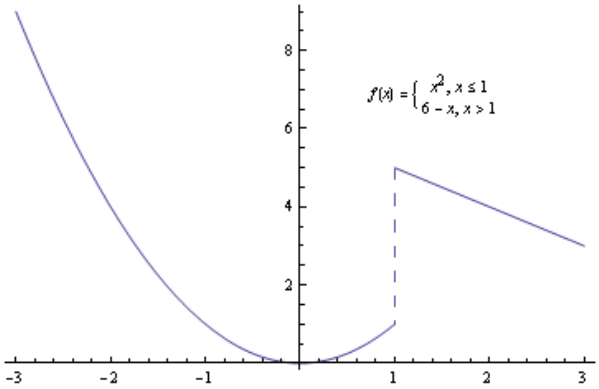


Fig. a Function not defined at c	**Fig. b** A Jump Discontinuity: Function exists at c, but the limit doesn't exist at c	**Fig. c** A Removable or Point Discontinuity Both function and limit exist at c, but they are not equal to one another







Without graphing, how can you tell if the function g(x) defined below is continuous at x=-2? At x=4?

$$g(x)=\begin{cases}-3x-8, & \text{for } x<-2\\ \frac{1}{2}x+5, & \text{for } -2\le x\le 4\\ 10-2x, & \text{for } x>4\end{cases}$$