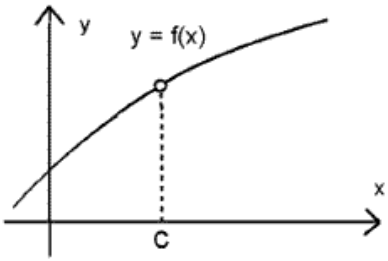
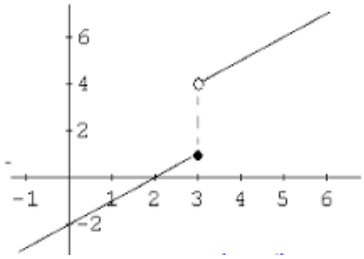
AP Calculus Sec 1.4 Continuity and One-sided Limits

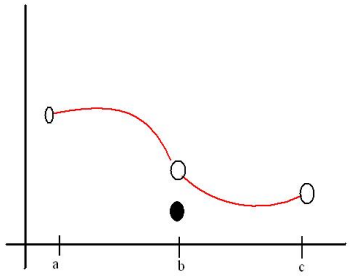
Continuity - Lets start when a function is not continuous.



graph with hole



graph jumps



graph with hole and point somewhere else

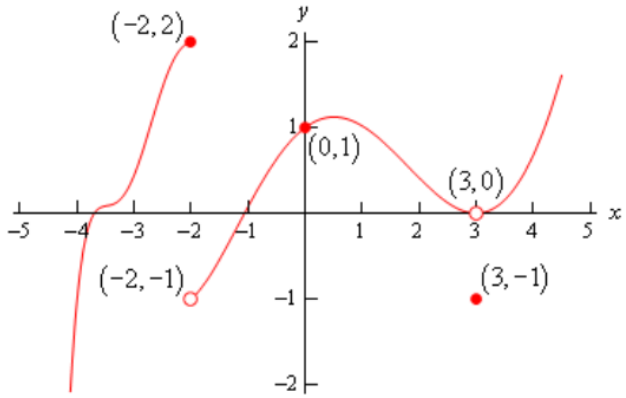
Definition of Continuity

1. f(c) is defined

2. $\lim_{x \to c} f(x)$ exists

3. $\lim_{x \to c} f(x) = f(c)$

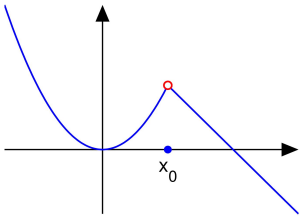
Example 1 Given the graph of *f(x)*, shown below, determine if *f(x)* is continuous at $x = -2$, $x = 0$, and $x = 3$.

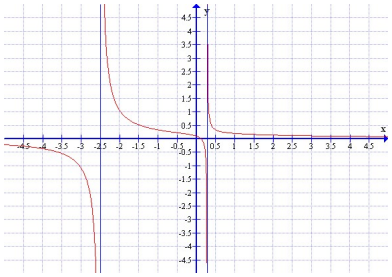


Discontinuities

Two Types!

1. removable - when function is factored and reduced. What was "cancelled out is the hole.
2. nonremovable - the asymptotes of a graph/function





One-Sided Limits (Continuity on a closed Interval)

One-sided limits used most when looking at a graph where a limit doesn't exist. We can look at the limit just coming from the positive or negative side.

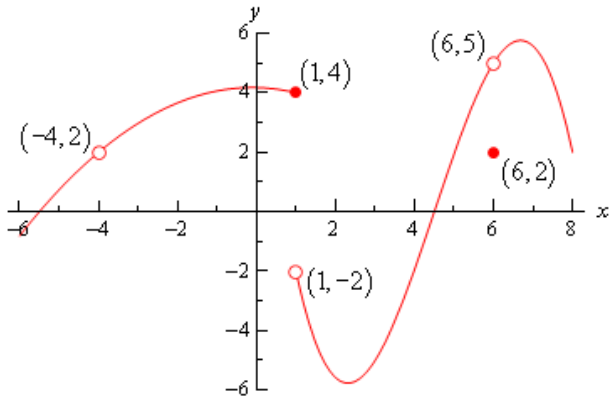
$\lim_{x \to c^+} f(x) = L$ $\lim_{x \to c^-} f(x) = L$

$\lim_{x \to 1^+} f(x) =$

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

$\lim_{x \to 6^+} f(x) =$

$\lim_{x \to 6^-} f(x) =$



Existence of a Limit

Must come from both sides!

Definition of Continuity on a Closed Interval

[a, b] if continuous on (a, b)

Properties of Continuity

1. b *f*
2. $f \pm g$
3. $f g$
4. f/g if $g(c) \neq 0$

* note: Graphs which are continuous: polynomials, radical, some trig.

Finally - if two functions are continuous, then its composite function is also continuous.

Intermediate Value Theorem

If *f* is continuous on [a, b] and K is any number between *f*(a) and *f*(b), then there is at least one number c in [a, b] such that *f*(c) = K