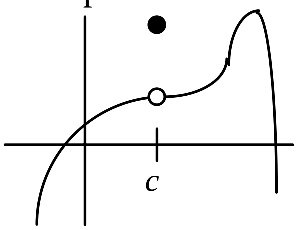
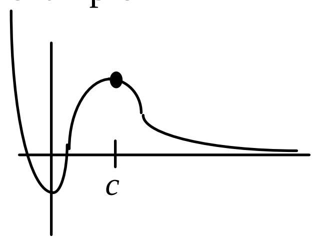
Limits

Note: The limit of a function at a value of *x* has nothing to do with what the function equals at *x*. ($\lim_{x\to c} f(x)$ doesn't necessarily equal *f*(*c*) .)

example 1



example 2



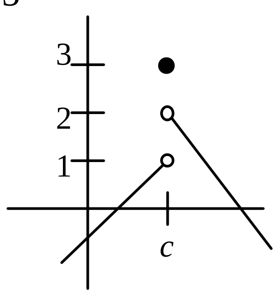
example 3

$$f(x)=\begin{cases}\dfrac{x^2+x}{x} & when\ x\neq 0\\ 0\quad when & x=0\end{cases}$$

Sometimes a function doesn't have a limit at a particular point. Example 4 $f(x)=\dfrac{1}{x}$.

Some functions approach a different value as *x* approaches a constant from the left (the negative (-)) than as *x* approaches that constant from the right (the positive (+)).

example 5



example 6

$$f(x)=\begin{cases}2x^2 & when\ x>1\\ 2x-1 & when\ x\leq 1\end{cases}$$

If $\lim_{x\to c^+} f(x)\neq \lim_{x\to c^-} f(x)$ we say $\lim_{x\to c} f(x)$ does not exist.

When a function grows or shrinks without bound we say it goes towards plus or minus infinity. In example 4: $\lim_{x\to 0^+} f(x)=$ and $\lim_{x\to 0^-} f(x)=$, even though $\lim_{x\to 0} f(x)\ d.n.e.$ (does not exist).

We can also evaluate the limit of a function as *x* approaches $\pm\infty$.

In example 2: $\lim_{x\to\infty} f(x)=0 \quad and \quad \lim_{x\to-\infty} f(x)=\infty$

In example 4: $\lim_{x\to\infty} f(x)=0 \quad and \quad \lim_{x\to-\infty} f(x)=0$