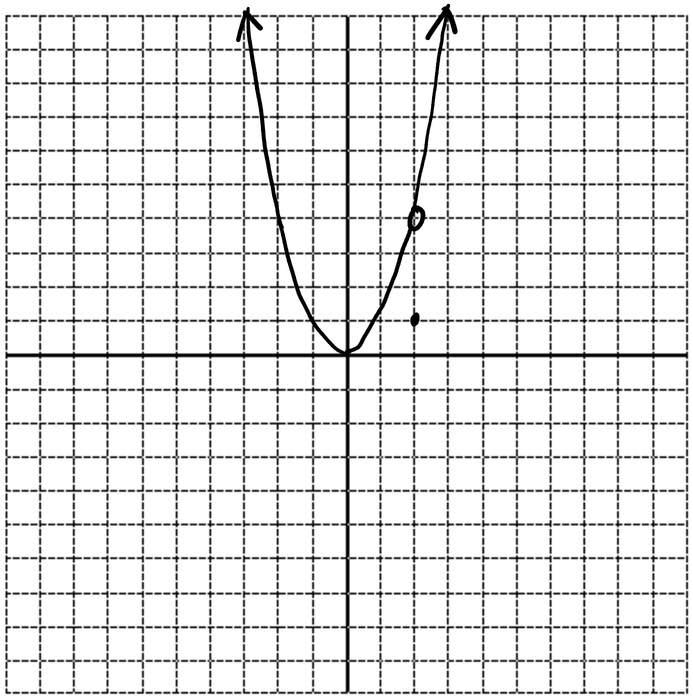
Graph the function:

$$f(x)=\begin{cases} x^2, x\in\Re, x\neq 2 \\ 1, x=2 \end{cases}$$



Calculate: $\lim_{x\to 2} f(x) = 4$

$f(2) = 1$

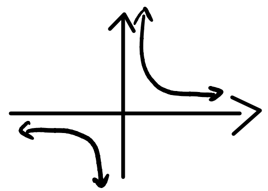
More Limits

The limit $\lim_{x \to a} f(x)$ exists and is equal to the finite value A if $\lim_{x \to a^-} f(x) = \lim_{x \to a^+} f(x) = A$.
We say that $f(x)$ **converges** to A as x approaches a.

from left   from right

Example #1

Calculate $\lim_{x \to 0} \frac{1}{x}$



$x \to 0^-$ $f(x) \to -\infty$

$x \to 0^+$ $f(x) \to +\infty$

$\lim_{x \to 0} \frac{1}{x}$ does not exist

Infinite Limits

$$\lim_{x\to\infty}\frac{1}{x} = 0$$

as x gets larger and larger

$$\lim_{x\to-\infty}\frac{1}{x} = 0$$

Example #2 - Evaluate each of the following limits:

a) $\lim\limits_{x\to\infty} \dfrac{2x+3}{x-4}$

$$= \lim_{x\to\infty} \frac{\frac{2x}{x} + \frac{3}{x}}{\frac{x}{x} - \frac{4}{x}}$$

$$= \lim_{x\to\infty} \frac{2 + \frac{3}{x}}{1 - \frac{4}{x}}$$

$$= \frac{2+0}{1-0} = 2$$

b) $\lim\limits_{x\to\infty} \dfrac{x^2-3x+2}{1-x^2}$

$$= \lim_{x\to\infty} \frac{\frac{x^2}{x^2} - \frac{3x}{x^2} + \frac{2}{x^2}}{\frac{1}{x^2} - \frac{x^2}{x^2}}$$

$$= \lim_{x\to\infty} \frac{1 - \frac{3}{x} + \frac{2}{x^2}}{\frac{1}{x^2} - 1}$$

$$= \frac{1}{-1} = -1$$

horizontal asymptote

$$\lim_{x\to\infty} \frac{5x^3 - 7x^2}{x^5} = 0$$

$$\lim_{x\to\infty} \frac{3x^2 + 5x - 7}{2x - 7x^2} = -\frac{3}{7}$$

oblique asymptote

$$\lim_{x\to\infty} \frac{7x^3 + 3}{5x^2} = \infty$$