(1) Let $f(x) = \frac{x-3}{x^2-x-6}$. What is $\lim_{x\to 3} f(x)$?

(2) What about $\lim_{x\to 2} f(x)$? What about $\lim_{x\to 2+} f(x)$, $\lim_{x\to 2-} f(x)$?

(3) Evaluate
   (a) $\lim_{x\to 1} \sin(\pi x)$

   (b) $\lim_{x\to \pi+} \frac{1}{\sin(x)}$, $\lim_{x\to \pi-} \frac{1}{\sin(x)}$.

(4) Either evaluate the limit or explain why it does not exist
   (a) $\lim_{x\to 1} f(x)$ where $f(x) = \begin{cases} \sqrt{x} & 0 \le x < 1 \\ 1 & x = 1 \\ 2 - x^2 & x > 1 \end{cases}$.
   (b) $\lim_{x\to 1} f(x)$ where $f(x) = \begin{cases} \sqrt{x} & 0 \le x < 1 \\ 1 & x = 1 \\ 4 - x^2 & x > 1 \end{cases}$.

2. Limit Laws

Fact. *Limits respect arithmetic operations and standard functions (e^x, sin, cos, log, ...)* **as long as everything is well-defined.**

(beware especially of division by zero)

(1) Evaluate using the limit laws:

    (a) $\lim_{x \to 2} \frac{x+1}{4x^2-1}$

    (b) $\lim_{x \to 1} \frac{e^x(x-1)}{x^2+x-2}$.

(2) Evaluate:

    (a) $\lim_{x \to 0} \frac{\sqrt{4+x}-2}{x}$.

    (b) $\lim_{x \to 0} x^2 \sin\left(\frac{\pi}{x}\right)$.

    (c) Suppose that $1 \le f(x) \le \left(x^2 - 2x + 2\right)$ for all x. Find $\lim_{x \to 1} f(x)$.