## MATH 100 – WORKSHEET 2 LIMITS

(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  $f(x) = \begin{cases} \sqrt{x} & 0 \le x < 1\\ 1 & x = 1\\ 4 - x^2 & x > 1 \end{cases}$ 

Date: 15/9/2014.

## 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  $1 \le f(x) \le (x^2 - 2x + 2)$  for all x. Find  $\lim_{x \to 1} f(x)$ .