# Week 1 questions

**Ex 1** Find the domain of the following functions

a) $\ln(1-\cos 2x)$.

b) $\tan\frac{2x}{x+1}$

c) $\arcsin(\sinh(x))$

d) $\sqrt{\tan x - 1}$.

**Ex 2** Determine the pairity (odd - even) of following functions

a) $y = \sin(\sin x))$

b) $y = \tan(\cos x)$

c) $\sinh^{-1}(x)$

d) $\arcsin(\sin x))$

**Ex 3** Study the following functions

a) $y = \arcsin x + \arccos x$

b) $y = \arcsin(\sin x)$

c) $y = \arccos(\cos x)$

d) $y = \arctan(\tan x)$

e) $y = \arctan x - \operatorname{arccot}\frac{1}{x}$.

**Hints**: Domain? Range? Pairity? Periodicity? Bounded near? Graph?

**Ex 4** Compute the limits (if exists)

a) $\lim_{n\to+\infty} (n^2 + \cos(\pi n))$

b) $\lim_{n\to+\infty} (n^2 \cdot \cos(n\pi))$

c) $\lim_{n\to+\infty} \frac{n^2}{\cos(\pi n)}$

d) $\lim_{n\to+\infty} \frac{\cos(\pi n)}{n^2}$

e) $\lim_{n\to+\infty} (n^2 - \cos(\pi n))$

f) $\lim_{n\to+\infty} n^{2+\cos(\pi n)}$.

**Remark** Given a sequence $u_n$, the case $\lim_{n\to+\infty} u_n = +\infty$ is different to the case $\lim_{n\to+\infty} u_n$ does not exist.

**Ex 5** Show that $\lim_{n\to+\infty} \cos(n)$ does not exist.

**Ex 6** (hard)

a) Show that $\sin(x) + \sin(\pi x)$ is not periodic

b) Show that $A\sin(mx) + B\sin(nx)$, $A, B \in \mathbb{R}$ $m, n \in \mathbb{Z}$ is periodic. Compute the smallest period.