1. Show, by definition, that

(a) $\lim_{x\to 2}\frac{x+5}{x^2-3} = 7$,

(b) $\lim_{x\to 3+}\frac{x^2+1}{x-3} = +\infty \quad (x>3)$,

(c) $\lim_{x\to 1}\frac{x}{x-1}$ not exist in $\mathbb{R}\cup\{-\infty,\infty\}$.

(d) $\lim_{x\to x_0}\sqrt{f(x)} = \sqrt{l}$ (and $l\geq 0$) if f is a non-negative real-valued function on $\mathbb{R}$ such that $\lim_{x\to x_0} f(x) = l \in \mathbb{R}$ and $x_0\in\mathbb{R}$.

2. State (without proof) the following results:

(a) Bolzano-Weierstrass Theorem; (b) Maximum-Minimum Theorem;

(c) Intermediate Value Theorem. (d) Uniform Continuity Theorem.

These theorems are allowed to used in the following Q3.

3. Prove/Disprove each of the following assertions: either ~~prove~~ prove it or show it is wrong (the continuity is assumed):

(a) $h(x) := \frac{1}{x}$ is uniformly continuous on $(0,\infty)$;

(b) $g(x) := \frac{1}{x}$ - - - - - - - - - - $[3,+\infty)$;

(c) Let $f:\mathbb{R}\to\mathbb{R}$ be continuous and $\lim_{x\to\infty} f(x) = l = \lim_{x\to-\infty} f(x) \in \mathbb{R}$.

Then f attains its max. or

f - - - - - min.