# Week 2 Recitations MATH:113, Recitations 304 and 305 

Names:

1. What are the limits of these sequences? Discuss, and plot at least one sequence on a whiteboard. (Hint: the limit of $Q$ is a special number that shows up often!)

$$
P=\{1,1 / 2,1 / 3,1 / 4, \ldots\} \quad Q=\left\{\left(1+\frac{1}{n}\right)^{n}\right\}_{n=1}^{\infty} \quad R=\{\sin (n)\}_{n=0}^{\infty}
$$

2. Find the domain and range of three of the following functions. On a whiteboard, sketch the curves for two of your chosen functions.

$$
f(x)=1 / x \quad g(x)=\ln (x) \quad h(x)=x^{2} \quad p(x)=x^{2}+1 \quad q(x)=x^{3}
$$

## Some notes.

1. Symbolically,

$$
\lim _{x \rightarrow p^{+}} f(x)
$$

reads "the limit of $f(x)$ as $x$ approaches $p$ from above" - this means that $x$ is always bigger than $p$, but is getting smaller as it gets closer to $p$. Similarly,

$$
\lim _{x \rightarrow p^{-}} f(x)
$$

reads "the limit of $f(x)$ as $x$ approaches $p$ from below" - this means that $x$ is always smaller than $p$, but is getting bigger as it gets closer to $p$.
2. We say that

$$
\lim _{x \rightarrow p} f(x)=L
$$

if and only if the upper and lower limits of $f$ at $p$ are the same. That is,

$$
\lim _{x \rightarrow p} f(x)=L
$$

is equivalent to

$$
\lim _{x \rightarrow p^{+}} f(x)=L=\lim _{x \rightarrow p^{-}} f(x) .
$$

3. Find these limits, and sketch a curve on a whiteboard for each limit you find.

$$
\begin{gathered}
\lim _{x \rightarrow \infty} 1 / x
\end{gathered} \lim _{x \rightarrow 0} 1 / x\left\{\begin{array}{l}
1 / x \\
\text { define } f \text { as } f(x)= \begin{cases}(x+1)^{2} & x<0 \\
x^{2}+2 & x>0\end{cases} \\
\lim _{x \rightarrow 0^{-}} f(x) \quad \lim _{x \rightarrow 0^{+}} f(x)
\end{array}\right.
$$

