Q.1 *Show the following statement from class: Let (X, d) be a metric space and let $A \subseteq X$. Then A is closed if and only if any sequence of elements of A that converges has its limit in A. In other words if $x_n \in A$ for all $n \in \mathbb{N}$ and $\lim_{n\to\infty} x_n = x$ then $x \in A$.*

Q.2 *(i) (Assignment sheet 2 problem 15) Show that if a sequence $\{x_n\}$ converges in a discrete metric space, then it is eventually constant.*

(ii) Find a metric space (X, d) and a set $A \subseteq X$ such that A is closed and bounded but is not sequentially compact.

Q.3 *(Assignment sheet 4 problem 4) The real axis and the imaginary axis divide $\mathbb{C}$ into four quadrants as follows:*

Ω_2	Ω_1
Ω_3	Ω_4

Determine the images of $\Omega_1, \Omega_2, \Omega_3, \Omega_4$ under the exponential map $z \mapsto e^z$.

Q.4 *(Assignment sheet 4 problem 6(b)) Give examples to illustrate that, in general, for complex numbers z, w,*

$$\mathit{Log}(zw) \neq \mathit{Log}(z) + \mathit{Log}(w).$$