8. To prove that if the sequence $\{a_n\}_{n=1}^{\infty} \to L$ as $n \to \infty$, then for $M > 0$, the sequence $\{Ma_n\}_{n=1}^{\infty} \to ML$.

Using the formal definition of limit of a sequence,

$a_m \to L$ as $n \to \infty$ iff $(\forall \varepsilon > 0)(\exists n \in \mathbb{N})(\forall m \geq n)[|a_m - L| < \varepsilon]$

Consider the expression $|a_m - L| < \varepsilon$

Multiplying both sides by M does not change the inequality as $M > 0$

i.e. $M|a_m - L| < M\varepsilon$

$\Rightarrow |Ma_m - ML| < M\varepsilon$

We can designate $M\varepsilon = \varepsilon'$. Since $M > 0$, $M\varepsilon > 0$ and any condition $(\forall \varepsilon > 0)$ also includes $(\forall M\varepsilon > 0)$ i.e. $(\forall \varepsilon' > 0)$

$\therefore$ $(\forall \varepsilon' > 0)(\exists n \in \mathbb{N})(\forall m \geq n)[|Ma_m - ML| < \varepsilon']$ is valid which is the definition of $\{Ma_n\}_{n=1}^{\infty} \to ML$ as $n \to \infty$. Hence proved.