Let $a_{n}$ be the sequence

$$
\begin{equation*}
a_{n}=n\left(\cos \left(\frac{1}{n}\right)-1\right) \tag{1}
\end{equation*}
$$

Observe that if we call:

$$
\begin{equation*}
f(x)=\frac{\cos (x)-1}{x} \tag{2}
\end{equation*}
$$

and

$$
\begin{equation*}
b_{n}=\frac{1}{n} \tag{3}
\end{equation*}
$$

then we have

$$
\begin{equation*}
a_{n}=f\left(b_{n}\right) \tag{4}
\end{equation*}
$$

We know that, after setting $f(0)=0, f(x)$ is a continuous function for all $x$ real. Moreover $\lim _{n \rightarrow \infty} b_{n}=0$. Thus it follows from Theorem 11.3.12 that

$$
\begin{equation*}
\lim _{n \rightarrow \infty} a_{n}=f\left(\lim _{n \rightarrow \infty} b_{n}\right)=f(0)=0 \tag{5}
\end{equation*}
$$

