Exercise 8. (Q2.3): A convergent sequence (b_n) with $b_n \neq 0$ for all n such that $(1/b_n)$ diverges.

Let $b_n = \frac{1}{n}$ for all $n \in \mathbb{N}$, then (b_n) converges to 0, and $b_n \neq 0$ for any n. Then $\frac{1}{b_n} = n$, thus $\left(\frac{1}{b_n}\right)$ is not bounded and therefore doesn't converge.