Exercise 4: Assume \((x_n)\) converges to \(x \in \mathbb{R}\). Show that \(\lim_{n \to \infty} x_{n+k} = x\) for all fixed \(k \in \mathbb{N}\).

Exercise 5: Let \((x_n)\) be the sequence defined recursively according to \(x_1 = 3\) and
\[
x_{n+1} = \frac{1}{4 - x_n}
\]
a) Prove that \((x_n)\) converges.

Hint: Show that \((x_n)\) is bounded and monotone and use Monotone Convergence Theorem

b) Find the limit of the sequence \((x_n)\).

Exercise 6: Let \((x_n)\) be a sequence such that \(\lim_{n \to \infty} x_n = 0\). Show that
\[
\lim_{n \to \infty} \sqrt{x_n} = 0.
\]

Exercise 7: Find the limit of the sequence \((x_n)\) given by \(x_n = \frac{2n^2 + 1}{n + n^2}\) for \(n \in \mathbb{N}\).