This note contains an example of a nowhere continuous weakly Picard operator. Such function contradicts Lemma 1 in [1].

**Definition 1** ([1, Definition 2]). Let X be a metric space. We say that a mapping  $f: X \to X$  is a weakly Picard operator if for each  $x \in X$  the sequence  $(f^n(x))_{n \in \mathbb{N}}$  is convergent to  $b_x \in X$ , which is a fixed point of f.

**Lemma 2** ([1, Lemma 1]). Let  $f: X \to X$  be a weakly Picard operator and let  $b \in X$  be a fixed point of f. Then f is continuous at point b.

Example 3. For  $q \in \mathbb{Q}$  let  $n_q \in \mathbb{Z}$  and  $d_q \in \mathbb{N}$  be such that  $q = \frac{n_q}{d_q}$  and  $\gcd(n_q, d_q) = 1$ . Consider a function  $f : \mathbb{R} \to \mathbb{R}$  defined as

$$f(x) = \begin{cases} 0, & x \in \mathbb{R} \setminus \mathbb{Q}, \\ d_x, & x \in \mathbb{Q}. \end{cases}$$

Notice that  $f(\mathbb{R}) = \mathbb{N}_0$  and  $f(\mathbb{N}_0) = \{1\}$ , hence for all  $x \in \mathbb{R}$  we get f(f(x)) = 1 = f(1). Furthermore f is discontinuous at each point of  $\mathbb{R}$ .

## References

[1] Vasile Berinde. On the solution of steinhaus functional equation using weakly picard operators. *Filomat*, 1, 04 2011.

Repository with the most recent version of this document: https://github.com/vil02/nowhere\_continuous\_wpo