A connection between a continued fraction and $\pi$

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Abstract

Here I present an interesting equality between a continued fraction where the arctan function is involved and $\pi$.

Keywords: arctan function, pi, continued fraction

The equality

Let $x$ denotes an integer such that $x > 1$. We define the function $f$ such that:

$$f(x) = \frac{1}{\pi} \arctan(x)$$

We have:

$$f(x) = \frac{1}{a + \frac{1}{b + \frac{1}{c + \frac{1}{d + \ldots}}}}$$

($a, b, c, d$ are integers $\geq 1$) We have:

$$\lim_{x \to \infty} \frac{x}{b} = \frac{4}{\pi}$$