A peculiar continued fraction

$$f(x) = \cfrac{1}{x + \cfrac{1}{x + \cfrac{1}{x + \ddots}}}$$

now consider f(x) - 1, in other words

$$f(x) = 1 + \cfrac{1}{x + \cfrac{1}{x + \cfrac{1}{x + \ddots}}} \quad \text{for x = 1 we have ...}$$

$$f(1) = 1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \ddots}}}$$

I will show that this continued fraction converges and surprisingly converges to the golden ratio