HW 1.1-6

Suppose that the Bisection Method with starting interval $[-2, 1]$ is used to find a root of the function $f(x) = \frac{1}{x}$. Does the method converge to a real number? Is it the root?

- Let $a = -2$, let $b = 1$
- Then $f(a) = -\frac{1}{2}$, $f(b) = 1$
  - Thus $f(a)f(b) = (-\frac{1}{2})(1) = -\frac{1}{2}$
  - By Theorem 1.2, if f is continuous on $[a,b]$ and $f(a)f(b) < 0$, then f has a root between a and b.
    - But $f = \frac{1}{x}$ is not continuous at $x = 0$, and $0 \in [-2, 1]$
    - By iteration, we can see that the function converges to 0.
    - But again, this is not defined at $x = 0$, thus it is <u>not</u> a root.