Question
Evaluate the limit

$$\lim_{h\to 0} \frac{\frac{1}{2+h} - \frac{1}{2}}{h}.$$

Answer
Either use l'Hopital's rule, since it has the indeterminate form $\frac{0}{0}$, or notice that this is the definition of the derivative of $f(x) = \frac{1}{x}$ at $x + 0 = 2$, namely

$$\lim_{h\to 0} \frac{\frac{1}{2+h} - \frac{1}{2}}{h} = f'(2) = -\frac{1}{4}.$$