1. The limit $\lim_{h\to 0} \dfrac{\dfrac{1}{2+h} - \dfrac{1}{2}}{h}$ represents the derivative of a function f at some point a.

   (a) Identify the function and the point.

   Comparing to $f'(a) = \lim_{h\to 0} \dfrac{f(a+h) - f(a)}{h}$, we have $f(x) = \dfrac{1}{x}$ and $a = 2$.

   (b) Evaluate the limit.

$$\begin{aligned}
\lim_{h\to 0} \frac{\dfrac{1}{2+h} - \dfrac{1}{2}}{h} &= \lim_{h\to 0} \frac{\dfrac{2-(2+h)}{(2+h)(2)}}{h} \\
&= \lim_{h\to 0} \frac{1}{h} \cdot \frac{-h}{2(2+h)} \\
&= \lim_{h\to 0} \frac{-1}{2(2+h)} = -\frac{1}{4}.
\end{aligned}$$

2. (**Bonus**) Using the definition of the derivative, show that for any differentiable function f and constant c, we have $(c \cdot f)'(x) = c \cdot f'(x)$

   Using the definition, we have:

$$\begin{aligned}
(c \cdot f)'(x) &= \lim_{h\to 0} \frac{(cf)(x+h) - (cf)(x)}{h} \\
&= \lim_{h\to 0} \frac{c(f(x+h)) - c(f(x))}{h} \\
&= \lim_{h\to 0} \frac{c(f(x+h) - f(x))}{h} \\
&= c \lim_{h\to 0} \frac{f(x+h) - f(x)}{h} = c(f'(x)).
\end{aligned}$$

3. Compute the derivatives of the following functions:

   (a) $f(x) = 3x^3 - 2x^2 + \sqrt{2}$

   Using sum, constant, and power rules, we have

   $$f'(x) = 3(3x^2) - 2(2x) + 0 = 9x^2 - 4x.$$

   (b) $g(x) = x^2 \sin(x)$

   Using the product rule (and the derivatives for x^2 and $\sin(x)$), we have

   $$\begin{aligned} g'(x) &= \left(\frac{d}{dx}(x^2)\right)\sin(x) + x^2\left(\frac{d}{dx}(\sin(x))\right) \\ &= 2x\sin(x) + x^2\cos(x). \end{aligned}$$

   (c) $h(x) = \dfrac{x^2 + x}{2 - 3x}$

   Using the quotient rule, we have

   $$\begin{aligned} h'(x) &= \frac{\left(\frac{d}{dx}(x^2 + x)\right)(2 - 3x) - (x^2 + x)\left(\frac{d}{dx}(2 - 3x)\right)}{(2 - 3x)^2} \\ &= \frac{(2x + 1)(2 - 3x) + 3(x^2 + x)}{(2 - 3x)^2}. \end{aligned}$$