

$$2. f(x) = \frac{1}{x-5}$$

$$\textcircled{1} f(x) = \frac{1}{x-5}$$

$$\textcircled{2} f(x+h) = \frac{1}{(x+h)-5}$$
$$= \frac{1}{x+h-5}$$

$$\textcircled{3} f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$
$$= \lim_{h \rightarrow 0} \frac{\frac{1}{x+h-5} - \frac{1}{x-5}}{h}$$
$$= \lim_{h \rightarrow 0} \frac{(x-5)(x+h-5) \left(\frac{1}{x+h-5} \right) - \frac{1}{x-5} (x-5)(x+h-5)}{h(x-5)(x+h-5)}$$

$$= \lim_{h \rightarrow 0} \frac{x-5 - (x+h-5)}{h(x-5)(x+h-5)}$$

$$= \lim_{h \rightarrow 0} \frac{\overset{\square}{x-5} - \overset{\square}{x-h+5}}{h(x-5)(x+h-5)}$$

$$= \lim_{h \rightarrow 0} \frac{-h}{h(x-5)(x+h-5)}$$

$$= \lim_{h \rightarrow 0} \frac{-1}{(x-5)(x+h-5)}$$

$$= \frac{-1}{(x-5)(x+0-5)}$$

$$= \frac{-1}{(x-5)^2}$$