1. $f(x) = 3 - x^2$

FINDING DERIVATIVE

① FIND $f(x)$

$f(x) = 3 - x^2$

② FIND $f(x+\Delta x)$

$f(x+\Delta x) = 3 - (x+\Delta x)^2$

$= 3 - (x+\Delta x)(x+\Delta x)$

$= 3 - (x^2 + x\Delta x + x\Delta x + (\Delta x)^2)$

$= 3 - (x^2 + 2x\Delta x + (\Delta x)^2)$

$= 3 - x^2 - 2x\Delta x - (\Delta x)^2$

③ PLUG IN $f(x)$ AND $f(x+\Delta x)$ INTO FORMULA AND FIND LIMIT

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{3 - x^2 - 2x\Delta x - (\Delta x)^2 - (3 - x^2)}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{3 - x^2 - 2x\Delta x - (\Delta x)^2 - 3 + x^2}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{-2x\Delta x - (\Delta x)^2}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{\Delta x(-2x - \Delta x)}{\Delta x}$$

$$= \lim_{\Delta x \to 0} -2x - \Delta x$$

$$= -2x - 0$$

$$= \boxed{-2x}$$

DERIVATIVE

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$