

S. 64, 2) b-d

b)

$$f(x) = -4x^2 - 2x \implies f'(x) = -8x - 2$$

c)

$$f(x) = -(2x + 1)^2 = -(4x^2 + 4x + 1) = -4x^2 - 4x - 1$$

Differenzenquotient:

$$\begin{aligned} \frac{f(x_0 + h) - f(x_0)}{x_0 + h - x_0} &= \frac{-4(x_0 + h)^2 - 4(x_0 + h) - 1 - (-4x_0^2 - 4x_0 - 1)}{h} \\ &= \frac{-4(x_0^2 + 2x_0h + h^2) - 4x_0 - 4h - 1 - (-4x_0^2 - 4x_0 - 1)}{h} \\ &= \frac{-4x_0^2 - 8x_0h - 4h^2 - 4x_0 - 4h - 1 + 4x_0^2 + 4x_0 + 1}{h} \\ &= \frac{-8x_0h - 4h^2 - 4h}{h} = -8x_0 - 4h - 4 \longrightarrow -8x_0 - 4 \end{aligned}$$

Also:

$$f'(x) = -8x - 4$$

d)

$$f(x) = \frac{1}{3}x - \frac{2}{3} \implies f'(x) = \frac{1}{3}$$