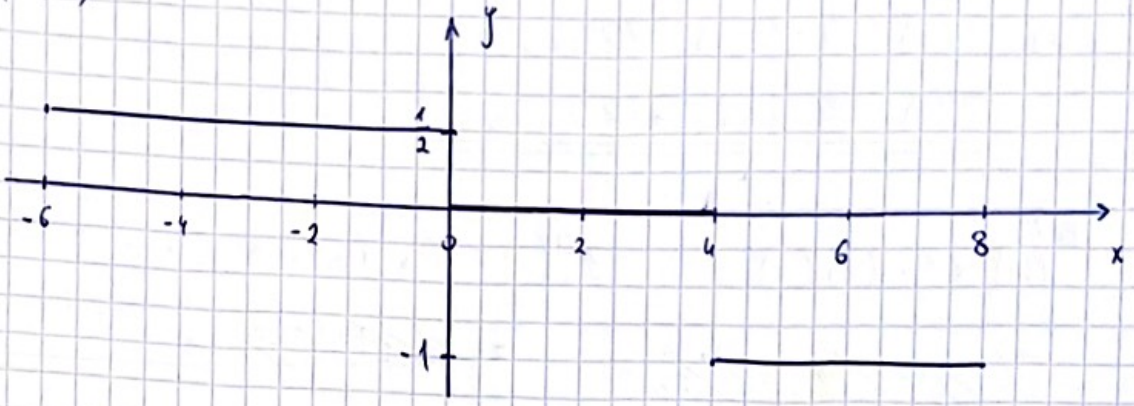
Mome Exercises 2

$f'(x)$

1.



2. $f(x) = 3x^2 + 5x$

$$f'(x) = \lim_{\Delta x \to 0} \frac{3(x+\Delta x)^2 + 5(x+\Delta x) - 3x^2 - 5x}{\Delta x} =$$

$$= \lim_{\Delta x \to 0} \frac{3(x^2 + 2x\cdot\Delta x + \Delta x^2) + 5x + 5\Delta x - 3x^2 - 5x}{\Delta x} =$$

$$= \lim_{\Delta x \to 0} \frac{3x^2 + 6x\cdot\Delta x + 3\Delta x^2 + 5\Delta x - 3x^2}{\Delta x} =$$

$$= \lim_{\Delta x \to 0} \frac{3\Delta x^2 + 5\Delta x + 6\Delta x \cdot x}{\Delta x} = \lim_{\Delta x \to 0} \frac{\Delta x(3\Delta x + 6x + 5)}{\Delta x} =$$

$$= \lim_{\Delta x \to 0} 3\Delta x^{0} + 6x + 5 = \underline{\underline{6x + 5}}$$

3. a) $f(x) = x^3$

$\underline{\underline{f'(x) = 3x^2}}$

b) $f(x) = 6x^{10}$

$\underline{\underline{f'(x) = 60x^9}}$

c) $f(x) = \frac{5}{x^3} = 5 \cdot x^{-3}$

$f'(x) = -3 \cdot 5 \cdot x^{-4} =$

$\underline{\underline{= -15x^{-4}}}$

4. a) $f(x) = \frac{1}{3}x^3 + 1$

$\underline{\underline{f'(x) = x^2}}$

b) $f(x) = x^2 + 4x + 3$

$\underline{\underline{f'(x) = 2x + 4}}$

c) $f(x) = \sum_{k=1}^{5} (a_k x + b_k)$

$f'(x) = \sum_{k=1}^{5} a_k$

5.

a) $f(x) = 4\sin(x) - 10\cos(x)$

$\underline{\underline{f'(x) = 4\cos(x) + 10\cos(x)}}$

b) $f(x) = x^2 \cdot \ln(x)$ $\quad f'(x) = 2x \cdot \ln(x) + \frac{1}{x} \cdot x^2 =$

$= \underline{\underline{x + 2x\ln(x)}}$

c) $f(x) = \frac{x^2+7}{2x-3}$

$f'(x) = \frac{2x(2x-3) - 2(x^2+7)}{(2x-3)^2} = \frac{4x^2 - 6x - 2x^2 - 14}{4x^2 - 12x + 9} =$

$= \frac{2x^2 - 6x - 14}{4x^2 - 12x + 9} = \underline{\underline{\frac{2(x^2 - 3x - 7)}{4x^2 - 12x + 9}}}$

6. a) $f(x) = (2x+4)^5 = 5(2x+4)^4 \cdot 2 = 10(2x+4)^4 =$

$= 10(2^4(x+2)^4) = 10 \cdot 16 (x+2)^4 = \underline{\underline{160(x+2)^4}}$

b) $3\sin(4x) = 3 \cdot \cos(4x) \cdot 4 = 12\cos(4x)$

c) $\frac{1}{1+e^{-(ax+b)}} = -\frac{1}{(1+e^{-(ax+b)})^2} \cdot \left(1+e^{-(ax+b)}\right)' =$

$= -\frac{1}{(1+e^{-(ax+b)})^2} \cdot e^{-(ax+b)} \cdot (-a) = \underline{\underline{\frac{a \cdot e^{-(ax+b)}}{1+e^{-(ax+b)}}}}$