

Nr. 9) a) $f = u \circ v$

$$v(2) = 0 \rightarrow u(0) = -2 \Rightarrow \underline{\underline{f(2) = -2}}$$

$$f' = (u \circ v)'$$

$$u'(v(2)) \cdot v'(2) = u'(0) \cdot v'(2) = 1 \cdot (-4) = \underline{\underline{-4}}$$

b) $g = v \circ u$

$$u(2) = 0 \rightarrow v(0) = 4 \Rightarrow g(2) = v(u(2)) = \underline{\underline{4}}$$

$$g' = (v \circ u)'$$

$$g'(2) = v'(u(2)) \cdot u'(2) = v'(0) \cdot u'(2) = 0 \cdot 1 = \underline{\underline{0}}$$

c) $v(x) = -x^2 + 4$; $u(x) = x - 2$

$$f(x) = u(v(x)) = (-x^2 + 4) - 2 = \underline{\underline{-x^2 + 2}}$$

$$f'(x) = -2x \Rightarrow \underline{\underline{f'(2) = -2 \cdot 2 = -4}} \checkmark$$

$$g(x) = v(u(x)) = -(x-2)^2 + 4$$

$$g'(x) = -2(x-2) = -2x + 4$$

$$\underline{\underline{g'(2) = -2 \cdot 2 + 4 = 0}} \checkmark$$

Nr. 10) a) $f(x) = (ax^3 + 1)^2 \Rightarrow f'(x) = 2 \cdot (ax^3 + 1) \cdot 3ax^2$

$$\underline{\underline{f'(x) = 6ax^2 \cdot (ax^3 + 1) = 6a^2x^5 + 6ax^2}}$$

b) $f(x) = \sin(ax^2) \Rightarrow f'(x) = \cos(ax^2) \cdot 2ax$

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

c) $f(x) = (\sin(ax))^2 \Rightarrow f'(x) = 2 \cdot (\sin(ax)) \cdot \cos(ax) \cdot a$

$$\underline{\underline{f'(x) = 2a \cdot \sin(ax) \cdot \cos(ax)}}$$

Nr. 10) d) $f(x) = \sin(a^2 x)$

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

e) $f(x) = \frac{3a}{1+x^2} = 3a \cdot (1+x^2)^{-1}$

$$f'(x) = -3a \cdot (1+x^2)^{-2} \cdot 2x = \underline{\underline{\frac{-3a \cdot 2x}{(1+x^2)^2} = \frac{-6ax}{(1+x^2)^2}}}$$

f) $f(x) = \sqrt{ax^2-3} = (ax^2-3)^{\frac{1}{2}}$

$$f'(x) = \frac{1}{2} (ax^2-3)^{-\frac{1}{2}} \cdot 2ax = \underline{\underline{\frac{ax}{\sqrt{ax^2-3}}}}$$

g) $f(a) = \sqrt{ax^2-3} = (ax^2-3)^{\frac{1}{2}}$

$$f'(a) = \frac{1}{2} \cdot (ax^2-3)^{-\frac{1}{2}} \cdot x^2 = \underline{\underline{\frac{x^2}{2 \cdot \sqrt{ax^2-3}}}}$$

h) $g(x) = \sqrt{t^2 \cdot x + 2t} = (t^2 \cdot x + 2t)^{\frac{1}{2}}$

$$g'(x) = \frac{1}{2} \cdot (t^2 x + 2t)^{-\frac{1}{2}} \cdot t^2 = \underline{\underline{\frac{t^2}{2\sqrt{t^2 x + 2t}}}}$$