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UTS Kalkulus

① $f(x) = 2x+3$ dan $g(x) = \frac{1}{x}$

a) $f+g$

$\Rightarrow (f+g)(x) = f(x) + g(x)$

$= (2x+3) + \left(\frac{1}{x}\right)$

$= \frac{2x^2+3x+1}{x}$ //

b) $\frac{f}{g}$

$\Rightarrow \frac{f(x)}{g(x)}$

$= \frac{2x+3}{\frac{1}{x}}$

$= 2x+3 \cdot \frac{3}{1}$

$= \frac{2x^2+3x}{1}$

c) $h(x) = (f \circ g)(x)$

$\Rightarrow (f \circ g)(x) = f(g(x))$

$= 2\left(\frac{1}{x}\right) + 3$

$= \frac{2}{x} + 3$

$= \frac{2+3x}{x}$

$D_{f \circ g} : \{x \mid x \in R, x \neq 0\}$

② $f(x) = \frac{1}{x^2}$

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

$\lim_{h \to 0} \frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h}$

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$$\lim_{h\to 0} \frac{\frac{x^2-(x+h)^2}{x^2(x+h)^2}}{h}$$

$$\lim_{h\to 0} \frac{\frac{x^2-(x^2+2xh-h^2)}{x^2(x+h)^2}}{h}$$

$$\lim_{h\to 0} \frac{\frac{x^2-x^2-2xh-h^2}{x^2(x+h)^2}}{h}$$

$$\lim_{h\to 0} \frac{\frac{-2xh-h^2}{x^2(x+h)^2}}{h}$$

$$\lim_{h\to 0} \frac{h(-2x-h)}{x^2(x+h)^2} \cdot \frac{1}{h}$$

$$\lim_{h\to 0} \frac{-2x-h}{x^2(x+h)^2}$$

$$\lim_{h\to 0} \frac{-2x-h}{x^2(x^2+2xh+h^2}$$

$$\lim_{h\to 0} \frac{-2x-h}{x^4+2x^3h+h^2x^2}$$

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$$= \frac{-2x - 0}{x^4 + 2x^3(0) + (0)^2 x^2}$$

$$= \frac{-2x}{x^4}$$

$$= \frac{-2}{x^3}$$

③ $f(x) = (3x+1)(8x-2)$

$\Rightarrow (f \cdot g)(x) = f'(x)\,g(x) + f(x)\,g'(x)$

misal

$u = 5x + 1 \qquad u' = 5$

$v = 8x - 2 \qquad v' = 8$

$y = u'v + uv'$

$= 5(8x-2) + (5x+1)8$

$= 40x - 10 + 40x + 8$

$= 80x - 2$ //

⑨ $y = (3x^2 - 2x)^{4/3}$

$\Rightarrow$

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

$y = u^{4/3}$

$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$

$\rightarrow \left(\frac{4}{3} u^{1/3}\right) \cdot (6x - 2)$

$= \frac{4}{3}(3x^2 - 2x)^{1/3} \cdot (6x - 2)$

$= \frac{4}{3}(6x - 2) \cdot (3x^2 - 2x)^{1/3}$

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(5) $\lim_{x \to 3} \frac{x^2+2x+15}{x^2-2x-3}$ → tidak bisa difaktorkan

=>

$= \frac{3^2+2(3)+15}{3^2-2(3)-3}$

$= \frac{30}{0}$ → tidak terdefinisi

(6) $f(x) = 2x^4+4x^3+2x^2-10$

=>

$f(x) = 2x^4+4x^3+2x^2-16$

$f'(x) = \frac{d}{dx}(2x^4+4x^3+2x^2-10)$

$f'(x) = \frac{d}{dx}(2x^4) + \frac{d}{dx}(4x^3) + \frac{d}{dx}(2x^2) - \frac{d}{dx}(10)$

$f'(x) = 2x \cdot 4x^3 + 4x \cdot 3x^2 + 2x \cdot 2x - 0$

$f'(x) = 8x^3 + 12x^2 + 4x$