

# Aturan rantai

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$$f'(u(x)) = u'(x)^9$$

$$f(x) = 10x^9$$

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

$$y = f(u(x)) \quad \frac{dy}{dx} = \frac{d(f(u(x)))}{d(u(x))} \cdot \frac{d(u(x))}{dx} = f'(u(x))u'(x)$$

fungsi komposisi

1.  $y = \frac{x^2 - 2x + 5}{x^2 + 2x - 3}$

2.  $y = (2x - 3)^{10}$

3.  $y = \sin^3 x$

4.  $y = \cos^4(4x^2 - x)$

5.  $y = \left(\frac{x+1}{x-1}\right)^2$

6.  $y = \sin x \tan [x^2 + 1]$

$u'(x) = 2 \Leftrightarrow f(x) = x^{10}$

$u(x) = 2x - 3$

$y = f(u(x)) \rightarrow y' = f'(u(x)) \cdot u'(x)$

$y' = 10(u(x))^9 \cdot 2 = 20(2x - 3)^9$

$u(x) = \sin x \rightarrow y = [u(x)]^3 \rightarrow y' = 3[u(x)]^2 \cdot u'(x)$

$u'(x) = \cos x$

$y' = 3 \sin^2 x \cos x$

$u(x) = \cos(4x^2 - x) \rightarrow y = [u(x)]^4$

$v(x) = 4x^2 - x \rightarrow u(x) = \cos v(x)$

$v'(x) = 8x - 1$

$u'(x) = -\sin(v(x)) \cdot v'(x)$

$u'(x) = -\sin(4x^2 - x)(8x - 1)$

$y = [u(x)]^4 \rightarrow y' = 4[u(x)]^3 \cdot u'(x)$

$y' = 4(\cos^3(4x^2 - x))(-\sin(4x^2 - x)(8x - 1))$

$$\boxed{y = f(u(x))} \rightarrow y' = f'(u(x)) \cdot u'(x)$$

Contoh.  $y = \cos^4(x) \rightarrow u(x) = \cos x \rightarrow u'(x) = -\sin x$   
 $y = [\cos x]^4 = \underline{[u(x)]^4}$

$$y' = 4 [u(x)]^3 \cdot u'(x)$$

$$= 4 \cos^3 x \cdot (-\sin x)$$

$$y' = \underline{-4 \cos^3 x \sin x}$$

5)  $y = \left(\frac{x+1}{x-1}\right)^2 = [u(x)]^2 \rightarrow y' = 2 u(x) \cdot u'(x)$

$$u(x) = \frac{x+1 \rightarrow g(x)}{x-1 \rightarrow h(x)} \rightarrow u'(x) = \frac{g'(x)h(x) - h'(x)g(x)}{(x-1)^2}$$

$$= \frac{1(x-1)h^2(x) - 1(x+1)}{(x-1)^2}$$

$$= \frac{\cancel{x-1} - \cancel{x-1}}{(x-1)^2}$$

$$= \frac{-2}{(x-1)^2}$$

$$y' = 2 \left(\frac{x+1}{x-1}\right) \cdot \frac{-2}{(x-1)^2}$$

$$= \frac{-4(x+1)}{(x-1)^3} //$$

\*)  $y = \sin^3(1-2x) = [\sin(1-2x)]^3 \rightarrow y = [u(x)]^3$

$$u(x) = \sin(1-2x) \rightarrow u'(x) \quad y' = 3[u(x)]^2 \cdot u'(x)$$

$$v(x) = 1-2x \rightarrow u(x) = \sin(v(x))$$

$$v'(x) = -2, \quad u'(x) = \cos(v(x)) \cdot v'(x)$$

$$v'(x) = -2, \quad u'(x) = \cos(v(x)) \cdot v'(x)$$
$$u'(x) = \cos(1-2x) \cdot (-2)$$
$$u'(x) = -2 \cos(1-2x)$$

$$\leftarrow y' = 3 \sin^2(1-2x) \cdot (-2 \cos(1-2x))$$
$$= -6 \sin^2(1-2x) \cos(1-2x)$$