

KONSEP TURUNAN

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

CONTOH 1

$$f(x) = \sin x$$

$$f(x+h) = (\quad + \quad)$$

INGAT : $\sin A - \sin B = \cos \frac{A+B}{2} \cdot \sin \frac{A-B}{2}$

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

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

Misal :

$A = x + h$ dan $B = x$ maka

$$\begin{aligned} A+B &= (\quad + \quad) + \quad = \quad + \quad \\ A-B &= (\quad + \quad) - \quad = \quad \end{aligned}$$

sehingga

$$\begin{aligned}\sin(x+h) - \sin x &= \sin \quad - \sin \\ \sin(x+h) - \sin x &= \cos \frac{+}{-} \cdot \sin \frac{-}{+} \\ \sin(x+h) - \sin x &= \cos \frac{+}{-} \cdot \sin \frac{-}{+}\end{aligned}$$

Diperoleh

$$\begin{aligned}f'(x) &= \lim_{h \rightarrow 0} \frac{2 \cos \left(\frac{2x+h}{2} \right) \cdot \sin \left(\frac{h}{2} \right)}{h} \\ f'(x) &= \lim_{h \rightarrow 0} \cos \left(\frac{+}{-} \right) \cdot \lim_{h \rightarrow 0} \frac{\sin(-)}{+} \\ f'(x) &= \lim_{h \rightarrow 0} \cos \left(- \right) \cdot \lim_{h \rightarrow 0} \frac{\sin(-)}{+} \\ f'(x) &= 2 \cdot \frac{1}{2} \\ f'(x) &= \\ \text{Jadi } f'(x) &= \end{aligned}$$

CONTOH 2

$$f(x) = \cos x$$

$$f(x+h) = \cos(\quad + \quad)$$

INGAT $\cos A - \cos B = -2 \sin\left(\frac{A+B}{2}\right) \sin\left(\frac{A-B}{2}\right)$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$
$$f'(x) = \lim_{h \rightarrow 0} \frac{\cos(\quad + \quad) - \cos \quad}{h}$$

Misal

$A = x + h$ dan $B = x$ maka

$$A + B = (\quad + \quad) + \quad = \quad + \quad$$
$$A - B = (\quad + \quad) - \quad = \quad$$

Sehingga

$$\cos(x+h) - \cos x = -2 \sin \quad - \cos \quad$$

$$\begin{aligned} \cos(x+h) - \cos x &= -\sin\left(\frac{+}{-}\right) \cdot \sin\left(\frac{-}{-}\right) \\ \cos(x+h) - \cos x &= -\sin\left(\frac{+}{-}\right) \cdot \sin(-) \end{aligned}$$

Diperoleh

$$\begin{aligned} f'(x) &= \lim_{h \rightarrow 0} \frac{-\sin\left(\frac{+}{-}\right) \cdot \sin(-)}{h} \\ f'(x) &= -\lim_{h \rightarrow 0} \frac{\sin\left(\frac{+}{-}\right) \cdot \sin(-)}{h} \\ f'(x) &= -\lim_{h \rightarrow 0} \sin\left(\frac{+}{-}\right) \cdot \lim_{h \rightarrow 0} \sin(-) \\ f'(x) &= -\sin(-) \cdot - \\ f'(x) &= -\sin \\ \text{Jadi } f'(x) &= -\sin \end{aligned}$$