

Lukion kenshoissa olleet tehtävät

$$\begin{aligned} \textcircled{1} \quad D \left( \frac{\cos(3x)}{x^4} \right) \\ &= \frac{-3 \sin 3x \cdot x^4 - 4x^3 \cdot \cos 3x}{(x^4)^2} \\ &= \frac{-3x^4 \cdot \sin 3x - 4x^3 \cdot \cos 3x}{x^8} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad D \left( 3x \cdot \sin(4x) \right) \\ &= 3 \sin(4x) + 4 \cos 4x \cdot 3x \\ &= 3 \sin(4x) + 12x \cdot \cos(4x) \end{aligned}$$

$$\frac{f'g - g'f}{g^2}$$

sinifunktio  
↓

$$\begin{aligned} f(x) &= \cos 3x \\ f'(x) &= -\sin 3x \cdot D(3x) \\ &= 3 \cdot (-\sin 3x) \\ &= -3 \sin 3x \\ g(x) &= x^4 \\ g'(x) &= 4x^3 \end{aligned}$$

$$\begin{aligned} D fg &= f'g + g'f \\ f(x) &= 3x \\ f'(x) &= 3 \\ g(x) &= \sin(4x) \\ g'(x) &= \cos(4x) \cdot D(4x) \\ &= 4 \cos 4x \end{aligned}$$

Yhdistetyn funktion derivaatta:

"Ulkofunktion derivaatta kertaa sisäfunktion derivaatta"

$$\begin{aligned} \textcircled{3} \quad & D(\tan(x^3)) \\ &= (1 + \tan^2(x^3)) \cdot D(x^3) \\ &= \underline{\underline{3x^2(1 + \tan^2(x^3))}} \end{aligned}$$

$$\begin{aligned} s(x) &= x^3 \\ s'(x) &= 3x^2 \\ u(x) &= \tan x \\ u'(x) &= 1 + \tan^2 x \\ &= \frac{1}{\cos^2 x} \end{aligned}$$

$$\begin{aligned} \underline{\underline{\text{TA1}}} \\ &= \frac{1}{\cos^2(x^3)} \cdot D(x^3) \\ &= \underline{\underline{\frac{3x^2}{\cos^2(x^3)}}} \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad & D(x^4 + \sin x^2) \\ &= D x^4 + D \sin x^2 \\ &= 4x^3 + \cos x^2 \cdot 2x \\ &= \underline{\underline{4x^3 + 2x \cdot \cos x^2}} \end{aligned}$$

Tässä on yhdistetty funktio

$$\begin{aligned} s(x) &= x^2 \\ s'(x) &= 2x \\ u(x) &= \sin x \\ u'(x) &= \cos x \end{aligned}$$

$$\begin{aligned}
 \textcircled{5} \quad D \quad & \frac{4x^1}{\cos x^2} \\
 = & \frac{4 \cdot \cos x - (-\sin x) \cdot 4x}{\cos^2 x} \\
 = & \frac{4 \cos x + 4x \cdot \sin x}{\cos^2 x}
 \end{aligned}$$

$$D \frac{f}{g} = \frac{f'g - g'f}{g^2}$$

$$\begin{aligned}
 f(x) &= 4x \\
 f'(x) &= 4 \\
 g(x) &= \cos x \\
 g'(x) &= -\sin x
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{6} \quad D \quad & (\tan(3x) + x^4) \\
 = & D(\tan(3x)) + D x^4 \\
 = & \frac{1}{\cos^2(3x)} + 4x^3
 \end{aligned}$$

$$\begin{aligned}
 s(x) &= 3x \\
 s'(x) &= 3
 \end{aligned}$$

$$u(x) = \tan(x)$$

$$u'(x) = \frac{1}{\cos^2 x} = 1 + \tan^2 x$$

TAI

$$= 1 + \tan^2(3x) + 4x^3$$