6. Polynomifunktion derivaatta

Esim. $f(x) = x^2$

$$f'(a) = \lim_{x\to a} \frac{f(x)-f(a)}{x-a} = \lim_{x\to a} \frac{x^2-a^2}{x-a} \left(\frac{0}{0}\right) = \lim_{x\to a} \frac{\cancel{(x-a)}(x+a)}{\cancel{x-a}}$$

$$= \lim_{x\to a} (x+a) = a+a = 2a$$

$f'(5) = 2\cdot 5 = 10$, $f'(-7) = 2\cdot(-7) = -14, \ldots$

$\Rightarrow f'(x) = 2x$ funktion f derivaattafunktio

Merk. $\underline{Dx^2 = 2x}$

Derivoimissääntöjä

1. $Dk = 0$, k vakio
2. $Dx^n = nx^{n-1}$
3. $D(k\cdot f(x)) = kDf(x) = kf'(x)$, k vakio
4. $D(f(x)+g(x)) = Df(x) + Dg(x) = f'(x) + g'(x)$

Esim. a) $Dx^{10} \overset{2.}{=} 10x^9$

b) $D(5\cdot x^6) \overset{3.}{=} 5\cdot Dx^6 \overset{2.}{=} 5\cdot 6x^5 = 30x^5$

c) $D(3x^7 - 6x^5 + 8x^4 - 9x^2 + 4x + 2)$

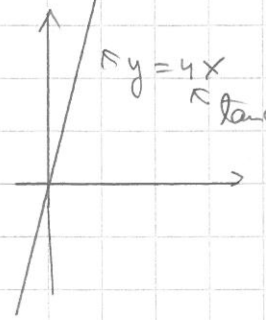
vakio

$= D(3x^7) + D(-6x^5) + D(8x^4) + D(-9x^2) + D(4x) + \underbrace{D(2)}_{=0}$

$= 21x^6 - 30x^4 + 32x^3 - 18x + 4$

Γ $D(4x) = D(4\cdot x^1) = 4Dx^1 = 4\cdot 1\cdot \underbrace{x^0}_{=1} = \underline{4}$

TAI:



tangentin kulmakerroin $k_t = 4$

Esim. $f(x) = x^3 + 3x^2 - 9x + 4$. Laske $f'(-2)$ ja määritä derivaatan 0-kohdat.

Ratk. $f'(x) = 3x^2 + 6x - 9$

$f'(-2) = 3\cdot(-2)^2 + 6\cdot(-2) - 9 = \underline{-9}$

f':n 0-kohdat: $f'(x) = 3x^2 + 6x - 9 = 0 \Leftrightarrow x = \begin{cases} -3 \\ 1 \end{cases}$

ratk. kaava