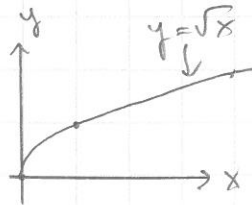


$$D x^m = m x^{m-1}$$

$$D (f(x))^m = m (f(x))^{m-1} \cdot f'(x)$$

$$D \sqrt{x} = D x^{\frac{1}{2}} = \frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{2} \cdot \frac{1}{x^{\frac{1}{2}}} = \frac{1}{2\sqrt{x}}, \quad x > 0$$



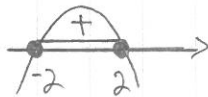
$$D \sqrt{3x^2+4} = D (3x^2+4)^{\frac{1}{2}} = \frac{1}{2} (3x^2+4)^{-\frac{1}{2}} \cdot 6x = \frac{3x}{\sqrt{3x^2+4}}, \quad x \in \mathbb{R}$$

K54. $f(x) = 5x + \sqrt{4-x^2}$

a) $4-x^2 \geq 0$

1° Vastenne ylläto: $4-x^2=0 \Leftrightarrow 4=x^2 \mid \sqrt{\Leftrightarrow} x = \pm\sqrt{4} = \pm 2$

2° Paraabelin kuvaaja:



3° Vastaus: $-2 \leq x \leq 2$

kun $-2 \leq x \leq 2$

b) $f(x) = 5x + (4-x^2)^{\frac{1}{2}}$ ja jatkuvasti derivoitua kun $-2 < x < 2$

$$f'(x) = 5 + \frac{1}{2} (4-x^2)^{-\frac{1}{2}} \cdot (-2x) = 5 - \frac{x}{\sqrt{4-x^2}} = 0 \mid \cdot \sqrt{4-x^2}$$

$$\Leftrightarrow 5\sqrt{4-x^2} - x = 0$$

$$\Leftrightarrow 5\sqrt{4-x^2} = x$$

$$\Leftrightarrow (5\sqrt{4-x^2})^2 = x^2$$

$$\Leftrightarrow 25(4-x^2) = x^2$$

$$\Leftrightarrow 100 - 25x^2 = x^2$$

$$\Leftrightarrow 100 = 26x^2 \quad | :26$$

$$\Leftrightarrow x = \pm \sqrt{\frac{100}{26}} = \frac{10}{\sqrt{26}} \approx 1,96$$

$|(\)|^2$ mod. puol. ≥ 0 kun $0 \leq x \leq 2$
huom!

Suurin ja pienin arvo löytyvät:

- päätärhdet: $f(-2) = -10$

$$f(2) = 10$$

- f' :n 0-tähdet: $f\left(\frac{10}{\sqrt{26}}\right) = 5 \cdot \frac{10}{\sqrt{26}} + \sqrt{4 - \frac{100}{26}} = \dots = 2\sqrt{26} \approx 10,2$

\Rightarrow suurin arvo: $2\sqrt{26}$, pienin arvo: -10