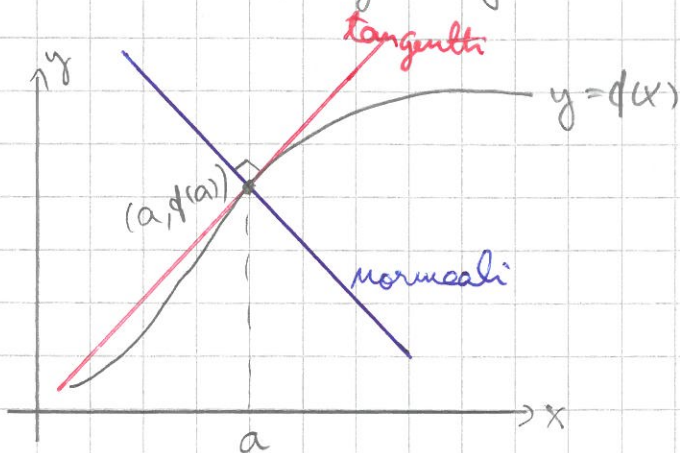


7. Tangentti ja normaali yhtälö



$$(x_0, y_0), k$$

$$\Rightarrow \text{more: } y - y_0 = k(x - x_0)$$

$$k_t = f'(a)$$

$$\Rightarrow \text{tangentti: } y - f(a) = f'(a)(x - a)$$

$$k_t \cdot k_n = -1 \quad (\Rightarrow) k_n = -\frac{1}{k_t} = -\frac{1}{f'(a)}$$

$$\Rightarrow \text{normaali: } y - f(a) = -\frac{1}{f'(a)}(x - a)$$

7.5

$$f(x) = -x^3 + 2x^2 + 1$$

$$f(2) = -2^3 + 2 \cdot 2^2 + 1 = 1 \quad \Rightarrow \text{piste: } (2, 1)$$

$$f'(x) = -3x^2 + 4x$$

$$\Rightarrow k_t = f'(2) = -3 \cdot 2^2 + 4 \cdot 2 = -12 + 8 = -4$$

$$\Rightarrow \text{tangentti: } y - 1 = -4(x - 2) \quad (\Rightarrow) y - 1 = -4x + 8 \quad (\Rightarrow) y = -4x + 9$$

7.15

$$y = -x^4 + 4x^2 - 2x = f(x)$$

$$f(1) = -1^4 + 4 \cdot 1^2 - 2 \cdot 1 = -1 + 4 - 2 = 1 \Rightarrow \text{piste: } (1, 1)$$

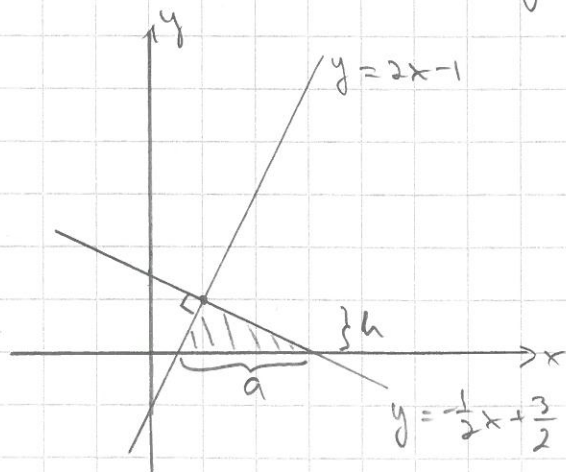
$$f'(x) = -4x^3 + 8x - 2$$

$$\Rightarrow k_t = f'(1) = -4 \cdot 1^3 + 8 \cdot 1 - 2 = -4 + 8 - 2 = 2$$

$$\Rightarrow \text{tangentti: } y - 1 = 2(x - 1) \quad (\Rightarrow) y = 2x - 1$$

$$k_n = -\frac{1}{k_t} = -\frac{1}{2}$$

$$\Rightarrow \text{normaali: } y - 1 = -\frac{1}{2}(x - 1) \quad (\Rightarrow) y = -\frac{1}{2}x + \frac{3}{2}$$



leikkauspisteet:

$$\begin{cases} y = 2x - 1 \\ y = -\frac{1}{2}x + \frac{3}{2} \end{cases} \Rightarrow \text{piste } (1, 1)$$

$$y = 0: y = 2x - 1 = 0 \quad (\Rightarrow) x = \frac{1}{2}$$

$$y = 0: y = -\frac{1}{2}x + \frac{3}{2} = 0 \quad (\Rightarrow) x = 3$$

$$A = \frac{1}{2} a h = \frac{1}{2} |3 - \frac{1}{2}| \cdot 1 = \frac{1}{2} \cdot \frac{5}{2} \cdot 1 = \frac{5}{4}$$