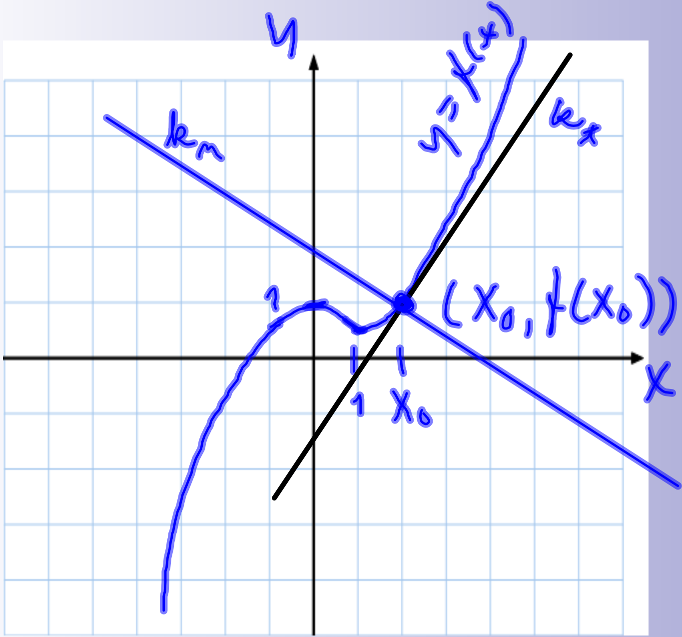
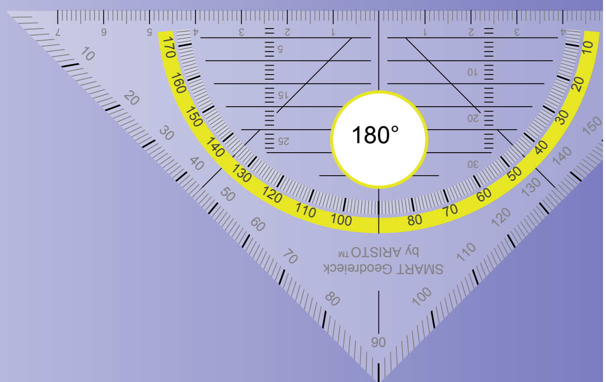
KÄYRÄN TANGENTTI JA NORMAALI



Käyrän $y = f(x)$ derivaatta pisteessä $(x_0, f(x_0))$ ilmaisee tangentin kulmakertoimen kyseisessä pisteessä.

tangentin yhtälö

$$k = \frac{f(x) - f(x_0)}{x - x_0} = k_t$$



$$y - y_0 = k_t(x - x_0)$$

$$k_t = f'(x_0)$$

$$k_n \cdot k_t = -1 \quad |: k_t \ (\neq 0)$$

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

esim

$$f(x) = x^3 - \frac{1}{2}x^2 + 2x - 1$$

Määritä kohtaan $x = 1$ tangentin ja normaalin yhtälöt.

(Piirrä kotona kuvaajat!)

Ratk. pol. f on jatk. & der.

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

$$k_t = f'(1) = 3\cdot 1^2 - 1 + 2 = \underline{4}$$

$$\underline{y_0} = f(1) = 1^3 - \frac{1}{2}\cdot 1^2 + 2\cdot 1 - 1 = \underline{1\tfrac{1}{2}}$$

$$y - y_0 = k_t(x - x_0)$$

$$y - \frac{3}{2} = 4(x - 1)$$

$$y = 4x - 4 + \frac{3}{2} = 4x - 2\tfrac{1}{2}$$

tang. $y = 4x - 2\frac{1}{2} \quad |\cdot 2$

$$\text{V}: 8x - 2y - 5 = 0$$

$$\boxed{\begin{aligned} k_t \cdot k_n &= -1 \\ k_n &= \frac{-1}{k_t} \end{aligned}}$$

$$k_n = \frac{-1}{4}$$

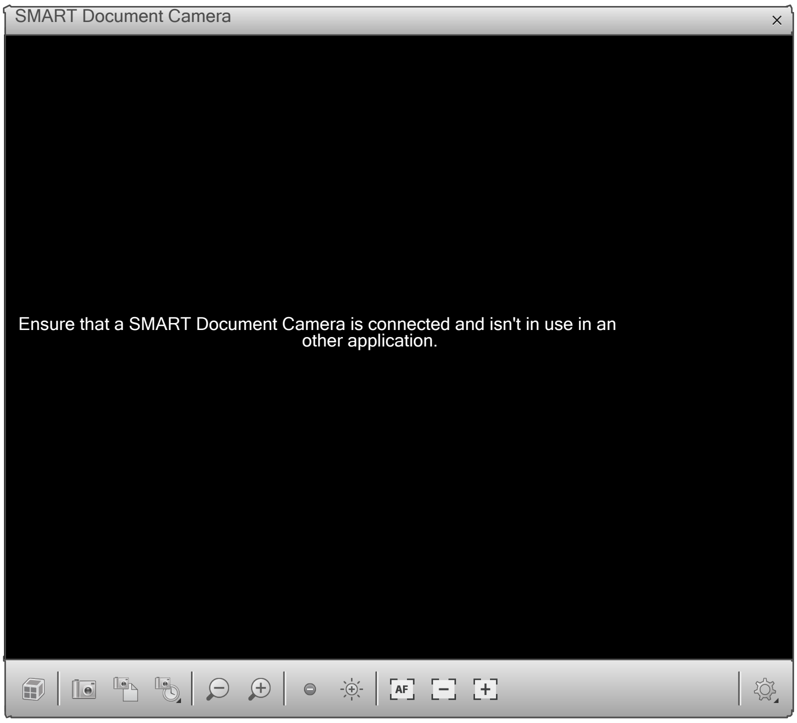
$$y - y_0 = k_n (x - x_0)$$

$$y - \frac{3}{2} = -\frac{1}{4}(x - 1)$$

$$\vdots$$

$$y = -\frac{1}{4}x + 1\frac{3}{4} \quad \Big| \cdot 4 \quad \underline{\text{norm.}}$$

$$\underline{\underline{n: x + 4y - 7 = 0}}$$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