

$B = (2x, 2y)$ on annetulla ympyrällä:

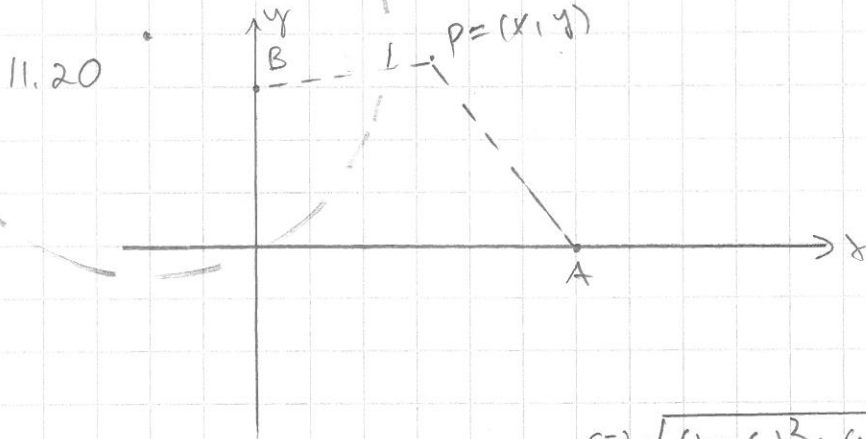
$$(2x)^2 + (2y)^2 - 4 \cdot 2x - 8 \cdot 2y + 19 = 0$$

3^o Sievennys:

$$\Rightarrow 4x^2 + 4y^2 - 8x - 16y + 19 = 0 \quad | :4$$

$$\Rightarrow x^2 + y^2 - 2x - 4y + \frac{19}{4} = 0$$

$$\Rightarrow \stackrel{(2,6)}{\Rightarrow} (x-1)^2 + (y-2)^2 = \frac{1}{4} \quad \text{ympyrä, } k_p = (1, 2), r = \sqrt{\frac{1}{4}} = \frac{1}{2}$$



$$A = (6, 0), B = (0, 3)$$

Käyrän yhtälön määrittely:

1^o Olkoon $P = (x, y)$ mielivaltaisen käyrän piste

2^o yhtälö x :lle ja y :lle

$$|PA| = 2|PB|$$

$$\Rightarrow \sqrt{(x-6)^2 + (y-0)^2} = 2\sqrt{(x-0)^2 + (y-3)^2} \quad | ()^2$$

mod. puol. ≥ 0

3^o Sievennys:

$$\Rightarrow (x-6)^2 + y^2 = 4[x^2 + (y-3)^2]$$

$$\Rightarrow x^2 - 12x + 36 + y^2 = 4(x^2 + y^2 - 6y + 9)$$

$$\Rightarrow x^2 - 12x + 36 + y^2 = 4x^2 + 4y^2 - 24y + 36$$

$$\Rightarrow 0 = 3x^2 + 3y^2 + 12x - 24y \quad | :3$$

$$\Rightarrow x^2 + 4x + y - 8y = 0 \quad | +2^2 + 4^2$$

$$\Rightarrow (x^2 + 2 \cdot x \cdot 2 + 2^2) + (y^2 - 2 \cdot y \cdot 4 + 4^2) = 2^2 + 4^2$$

$$\Rightarrow (x+2)^2 + (y-4)^2 = 20 \quad \text{ympyrä, } k_p = (-2, 4), r = \sqrt{20} = \sqrt{4 \cdot 5} = 2\sqrt{5}$$

$$\Gamma \quad 4^2 + 2^2 = 20$$

$$(2+2)^2 + (6-4)^2 = 20 \quad \Rightarrow (2, 6) \text{ on ympyrällä}$$

12. Ympyrän leikkauspiste

12.4

$$\begin{cases} x^2 + y^2 - 8x - 4y + 15 = 0 & \leftarrow \text{rj.} \\ x^2 + y^2 + 8x - 12y + 7 = 0 & | \cdot (-1) \\ \hline -16x + 8y + 8 = 0 & | :8 \Rightarrow -2x + y + 1 = 0 \Rightarrow y = 2x - 1 \end{cases}$$

$$\Rightarrow x^2 + (2x-1)^2 - 8x - 4(2x-1) + 15 = 0$$

$$\Rightarrow x^2 + 4x^2 - 4x + 1 - 8x - 8x + 4 + 15 = 0$$

$$\Rightarrow 5x^2 - 20x + 20 = 0 \quad | :5 \Rightarrow x^2 - 4x + 4 = 0 \Rightarrow x = 2 \quad (\text{noll. } 2 \text{ kerta})$$

$$\Rightarrow y = 2 \cdot 2 - 1 = 3$$

Vast. leikkauspiste: (2, 3)