

Ympyrän keskipiste on suoralla $y = x - 2$
 $\Rightarrow K_p = (a, a - 2)$
 $\Rightarrow r = |a - 2|$

$y = \frac{4}{3}x + 4 \quad | \cdot 3$
 $\Rightarrow 4x - 3y + 12 = 0$
 Kp:n etäisyys suorasta = säde;

$$d = \frac{|4a - 3(a - 2) + 12|}{\sqrt{4^2 + (-3)^2}} = |a - 2| \cdot 5$$

$$\Rightarrow |a + 18| = 5|a - 2| \Rightarrow |a + 18| = 5a - 10$$

$$\Rightarrow a + 18 = 5a - 10 \text{ tai } a + 18 = -(5a - 10) \Rightarrow a = 7 \text{ tai } a = -\frac{4}{3}$$

1^o $a = 7 \Rightarrow K_p = (7, 7 - 2) = (7, 5), r = |5 - 7| = 2 \Rightarrow (x - 7)^2 + (y - 5)^2 = 2^2$

2^o $a = -\frac{4}{3} \Rightarrow K_p = (-\frac{4}{3}, -\frac{4}{3} - 2) = (-\frac{4}{3}, -\frac{10}{3}), r = |-\frac{10}{3} - (-\frac{4}{3})| = \frac{10}{3} \Rightarrow (x + \frac{4}{3})^2 + (y + \frac{10}{3})^2 = (\frac{10}{3})^2$

3¹ a) V; $(x + 2)^2 + (y + 5)^2 = 7$ ympyrä, $K_p = (-2, -5), r = \sqrt{7}$

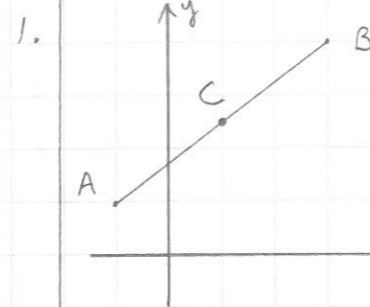
b) %; $\begin{cases} 2x + 3y - 4 = 0 & | : 3 \Rightarrow y = -\frac{2}{3}x + \frac{4}{3} \Rightarrow k_1 = -\frac{2}{3} \\ 15x - 10y + 8 = 0 & | : 10 \Rightarrow y = \frac{3}{2}x + \frac{4}{5} \Rightarrow k_2 = \frac{3}{2} \end{cases}$
 $k_1 \cdot k_2 = -\frac{2}{3} \cdot \frac{3}{2} = -1 \Rightarrow$ suorat ovat \perp

c) V; $3x + 4y^2 - 1 = 0 \quad | : 3 \Rightarrow x = -\frac{4}{3}y^2 + \frac{1}{3} \Rightarrow$ raseemalle aiheava parabeli ($a = -\frac{4}{3} < 0$)

d) %; $(x - 2)^2 + (y + 3)^2 = 9$ ympyrä, $K_p = (2, -3), r = \sqrt{9} = 3$
 suoralla $x = 5$ on jyrkempiä ja kulkee n:n keskeisellä Kp:llä

e) %; $\begin{cases} 2x + 4y + 5 = 0 \\ y = -\frac{1}{2}x - \frac{5}{4} \end{cases} \Rightarrow 2x + 4(-\frac{1}{2}x - \frac{5}{4}) + 5 = 0$
 $\Rightarrow 2x - 2x - 10 + 5 = 0 \Rightarrow -5 = 0 \quad \downarrow$ epätori

d) %; $(x - 1)^2 + y^2 = 4$ ympyrä, $K_p = A = (1, 0), r_1 = \sqrt{4} = 2$
 $(x + 1)^2 + (y + 2)^2 = 9$ ympyrä, $K_p = B = (-1, -2), r_2 = \sqrt{9} = 3$
 $C = (1, -3) \quad |AC| = \sqrt{(1 - 1)^2 + (-3 - 0)^2} = 3 > r_1 \Rightarrow$ ulkopuol.
 $|BC| = \sqrt{(1 - (-1))^2 + (-3 - (-2))^2} = \sqrt{5} < r_2 \Rightarrow$ sisäp.



$A = (-1, 1), B = (3, 4)$

a) $|AB| = \sqrt{(3 - (-1))^2 + (4 - 1)^2} = \sqrt{4^2 + 3^2} = \sqrt{25} = 5$

keskipiste: $C = (\frac{-1 + 3}{2}, \frac{1 + 4}{2}) = (1, \frac{5}{2})$

b) $k = \frac{\Delta y}{\Delta x} = \frac{4 - 1}{3 - (-1)} = \frac{3}{4}$

suora: $y - 4 = \frac{3}{4}(x - 3) \Rightarrow y = \frac{3}{4}x + \frac{7}{4}$

2. omenehilo: x (m²) litra hui-hai-juomaa: y (m²)

$$\begin{cases} 3x + 4y = 20,3 & | \cdot (-2) \\ 6x + 5y = 30,1 & \leftarrow \text{rj.} \end{cases}$$

$$\begin{aligned} -3y &= -10,5 & | : (-3) \Rightarrow y &= 3,5 \Rightarrow 6x + 5 \cdot 3,5 = 30,1 \Rightarrow x = 2,1 \end{aligned}$$

Vast. omenehilo: 2,1 m², litra hui-hai-juomaa: 3,5 m²

2¹ a) $|2x - 3| = 5$
 $\Rightarrow 2x - 3 = 5$ tai $2x - 3 = -5 \Rightarrow 2x = 8$ tai $2x = -2 \Rightarrow x = 4$ tai $x = -1$

b) $|x^2 + 6x + 2| = |2x + 14|$
 $\Rightarrow x^2 + 6x + 2 = 2x + 14$ tai $x^2 + 6x + 2 = -(2x + 14)$
 $\Rightarrow x^2 + 4x - 12 = 0$ tai $x^2 + 8x + 16 = 0$
 $\Rightarrow x = \frac{-4 \pm \sqrt{4^2 - 4 \cdot (-12)}}{2 \cdot 1} = \frac{-4 \pm 8}{2} = \begin{cases} 2 \\ -6 \end{cases}$ tai $x = \frac{-8 \pm \sqrt{8^2 - 4 \cdot 16}}{2 \cdot 1} = \frac{-8 \pm 0}{2} = -4$

3. a) $ax + y + 3 = 0 \Rightarrow y = -ax - 3 \Rightarrow k_1 = -a$
 $3x + 2y - 1 = 0 \quad | : 2 \Rightarrow y = -\frac{3}{2}x + \frac{1}{2} \Rightarrow k_2 = -\frac{3}{2}$
 suorat kohtisuorassa $\Rightarrow k_1 \cdot k_2 = -a \cdot (-\frac{3}{2}) = -1 \Rightarrow a = -\frac{2}{3}$

b) $y = \frac{3}{5}x - 1 \quad | \cdot 5 \Rightarrow 3x - 5y - 5 = 0, \quad (-3, 2)$
 $d = \frac{|3 \cdot (-3) - 5 \cdot 2 - 5|}{\sqrt{3^2 + (-5)^2}} = \frac{|-24|}{\sqrt{34}} = \frac{24}{\sqrt{34}} (\approx 4,12)$

4. $x^2 + y^2 - 6x + 4y + 3 = 0$
 $\Rightarrow x^2 - 6x + y^2 + 4y = -3 \quad | + 3^2 + 2^2$
 $\Rightarrow (x^2 - 2 \cdot x \cdot 3 + 3^2) + (y^2 + 2 \cdot y \cdot 2 + 2^2) = -3 + 3^2 + 2^2$
 $\Rightarrow (x - 3)^2 + (y + 2)^2 = 10$
 ympyrä, $K_p = A = (3, -2), r = \sqrt{10}$
 $|AB| = \sqrt{(3 - (-1))^2 + (-2 - 3)^2} = \sqrt{4^2 + (-5)^2} = \sqrt{41}$
 $d = |AB| - r = \sqrt{41} - \sqrt{10} (\approx 3,24)$

