Lin rce $\boxed{y' + p(x)y = q(x)}$ p, q spoj. na int. (a, b)

- $y' - \underbrace{\frac{1}{x+2}}_{p(x)} y = \underbrace{(x+2)}_{q(x)}$ $\quad x \neq -2$ $\quad x \in (-\infty, -2), (-2, \infty)$

- $y' - \frac{1}{x+2} y = 0$

$$y' = \frac{1}{x+2} y \qquad y \equiv 0 \quad (\text{řeš.})$$

$$\int \frac{1}{y}\, dy = \int \frac{1}{x+2}\, dx$$

$$\ln|y| = \ln|x+2| + k$$

$$|y| = e^k |x+2|$$

$$y = \underbrace{\pm e^k}_{L} (x+2)$$

$$y_h = L(x+2) \qquad \boxed{L \in \mathbb{R}}$$

- $y_p = L(x)(x+2)$

$$y_p' = L'(x)(x+2) + L(x)\cdot 1$$

$$L'\cdot(x+2) + \cancel{L} - \frac{1}{x+2} \cancel{L\cdot(x+2)} = x+2$$

$$L'(x+2) = (x+2), \quad L' = 1$$

$$\underline{L = x + D} \qquad D \in \mathbb{R}.$$

- Závěr: $\quad \underline{y = (x+D)(x+2)} \qquad \underline{x \in (-\infty, -2),\ x \in (-2, \infty)}$

- $(x+2)y' - y = (x+2)^2 \qquad : x+2$

$x \in (-\infty, -2) \qquad x \in (-2, \infty) \qquad \boxed{x \in \mathbb{R}}$

$$y' - \frac{y}{x+2} = x+2$$

$$y_1 = (x+D_1)(x+2) \qquad x < -2$$

$$y_2 = (x+D_2)(x+2) \qquad x > -2$$

Spoj:

y_1 $\quad$ -2 $\quad$ y_2

$$\lim_{x\to -2-} y_1 = \lim_{x\to -2-}(x+D_1)(x+2) = 0 = \lim_{x\to -2+} y_2 = \lim (x+D_2)(x+2)$$

dco:

$$\lim_{x\to -2-} y_1' = \lim D_1 + 2x + 2 = D_1 - 2$$

chceme $=$

$$\lim_{y\to -2+} y_2' = \lim D_2 + 2x + 2 = D_2 - 2$$

$\to \quad D_1 = D_2$

Závěr

$$y = (x+D_1)(x+2) \qquad x \in \mathbb{R}$$

Splňuje rovnici v $x=-2$

$$(x+2)y' - y = (x+2)^2$$

$x = -2$

$y(-2) = 0$

$y' = D_1 - 2$

$$0(D_1 - 2) - 0 = 0 \quad \checkmark$$

$$y' - \frac{2}{x+2}y = 2(x+2)\sqrt{y}$$

$y^{1/2}$

$y > 0$

$z = y^{1-\alpha}$ $\qquad \alpha = 1/2$

$z = y^{1-1/2} = y^{1/2}$

$z > 0$

$y = z^2 \qquad y' = 2z\cdot z'$

$z \equiv 0$

$$2z\cdot z' - \frac{2}{x+2}z^2 = 2(x+2)z \qquad |:2z$$

$$z' - \frac{z}{x+2} = (x+2) \qquad z > 0$$

$$z = (x+2)(x+D) \qquad x \in (-\infty,-2) \quad x \in (-2,\infty)$$