DIFERENTIAL EQUATIONS of the FIRST ORDER

Ordinary differential equation with SEPARATED VARIABLES

is differential equation in the form

$$p(x) + q(y)y' = 0$$

where $p(x)$ is continuous function on interval (a, b) and $q(y)$ is continuous function on interval (c, d).

Any solution of ODE $p(x) + q(y)y' = 0$ is in the form

$$\int p(x)dx + \int q(y)dy = c, c \in R$$

Note: If je $q(y) \neq 0$ on interval (c, d), then exactly one integral curve is passing through any point of set $D = (a, b) \times (c, d)$.

Ordinary differential equation with SEPARABLE VARIABLES

is differential equation in the form

$$p_1(x)\,.\,q_1(y) + p_2(x)\,.\,q_2(y)\,y' = 0$$

where $p_1(x)$, $p_2(x)$ are continuous functions on (a, b) and $q_1(y)$, $q_2(y)$ are continuous functions on (c, d).

If $p_2(x)\,.\,q_1(y) \neq 0$, then ODE is equivalent with ODE

$$\frac{p_1(x)}{p_2(x)} + \frac{q_2(y)}{q_1(y)}\,y' = 0$$

Solution of ODE

$$p_1(x) \,.\, q_1(y) + p_2(x) \,.\, q_2(y)\, y' = 0$$

are all functions defined by equation

$$\int \frac{p_1(x)}{p_2(x)} dx + \int \frac{q_2(y)}{q_1(y)} dy = c, c \in R$$

and constant functions (singular solutions)

$$y_i = b_i \text{, pre } q_1(y_i) = 0$$