

First-Order Partial Differential Equations > Linear Equations > Section 1.2

10.
$$\frac{\partial w}{\partial x} + \left[f(x) + g(x)e^{\lambda y} \right] \frac{\partial w}{\partial y} = h(x)$$
.

General solution:

$$w = \int h(x) \, dx + \Phi(u),$$

where $\Phi(u)$ is an arbitrary function,

$$u = e^{-\lambda y} F(x) + \lambda \int g(x) F(x) dx, \quad F(x) = \exp\left[\lambda \int f(x) dx\right].$$

Reference

Polyanin, A. D., Zaitsev, V. F., and Moussiaux, A., Handbook of First Order Partial Differential Equations, Taylor & Francis, London, 2002.

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http://eqworld.ipmnet.ru/en/solutions/fpde/fpde1210.pdf