

First-Order Partial Differential Equations > Quasilinear Equations > Section 2.3

1.
$$\frac{\partial w}{\partial x} + aw \frac{\partial w}{\partial y} = f(x)$$
.

General solution:

$$y = ax \big[w - F(x) \big] + a \int F(x) \, dx + \Phi \big(w - F(x) \big), \qquad F(x) = \int f(x) \, dx,$$

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

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/fpde2301.pdf