

First-Order Partial Differential Equations > Nonlinear Equations > Section 3.3

17.
$$\left(\frac{\partial w}{\partial x}\right)^2 + \left(\frac{\partial w}{\partial y}\right)^2 = F\left(x^2 + y^2, y\frac{\partial w}{\partial x} - x\frac{\partial w}{\partial y}\right).$$

Complete integral:

$$w = -C_1 \arctan \frac{y}{x} + \frac{1}{2} \int \sqrt{\xi F(\xi, C_1) - C_1^2} \, \frac{d\xi}{\xi} + C_2, \quad \text{where} \quad \xi = x^2 + y^2,$$

 C_1 and C_2 are arbitrary constants.

References

Kamke, E., Differentialgleichungen: Lösungsmethoden und Lösungen, II, Partielle Differentialgleichungen Erster Ordnung für eine gesuchte Funktion, Akad. Verlagsgesellschaft Geest & Portig, Leipzig, 1965.

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

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