

First-Order Partial Differential Equations > Nonlinear Equations > Section 3.2

6. 
$$\left(\frac{\partial w}{\partial x}\right)^2 + \left(\frac{\partial w}{\partial y}\right)^2 = f(x^2 + y^2)$$
.

Hamilton's equation for the plane motion of a point mass under the action of a central force. Complete integral:

$$w = C_1 \arctan \frac{x}{y} + C_2 \pm \frac{1}{2} \int \sqrt{zf(z) - C_1^2} \frac{dz}{z}, \qquad z = x^2 + y^2,$$

where  $C_1$  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.

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