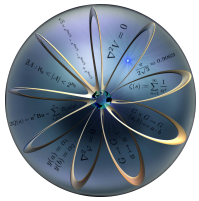

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Bernoulli equation

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The *Bernoulli equation* has the form

$$\frac{dy}{dx} + f(x)y \;=\; g(x)y^k \tag{1}$$

where f and g are continuous real functions and k is a $(\neq 0,\ \neq 1)$. Such a `http://planetmath.org/DifferentialEquation`nonlinear equation is got e.g. in examining the motion of a by y^k. It yields

$$y^{-k}\frac{dy}{dx} + f(x)y^{-k+1} \;=\; g(x). \tag{2}$$

The substitution

$$z \;:=\; y^{-k+1} \tag{3}$$

transforms (2) into

$$\frac{dz}{dx} + (-k+1)f(x)z \;=\; (-k+1)g(x)$$

which is a linear differential equation of first order. When one has obtained its general solution and made in this the substitution (3), then one has solved the Bernoulli equation (1).

References

[1] N. Piskunov: *Diferentsiaal- ja integraalarvutus kõrgematele tehnilistele õppeasutustele.* – Kirjastus Valgus, Tallinn (1966).