L04-S00

Separable differential equations

MATH 2250 Lecture 04 Book section 1.4

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Separable equations

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There is a sub-class of first-order differential equations that we can solve explicitly.

A first-order DE is called **separable** if it can be written as

$$\frac{\mathrm{d}y}{\mathrm{d}x} = f(x,y) = h(x)k(y),$$

for some functions h(x) and k(y).

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for some functions h(x) and k(y).

Separable equations can often be solved explicitly.

Example

Compute the general solution to

$$y' = 6xy$$

Separable equation examples

Many solutions from this *separation of variables* procedure are **implicitly** defined.

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Compute the general solution to

$$y' = \frac{h(x)}{g(y)}$$

Separable equation examples

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Compute the general solution to

$$y' = \frac{-x}{y}$$

 $y' = \frac{h(x)}{q(y)}$

What are the particular solutions for y(2) = 0 and y(0) = 2?

The situation is actually a bit perilous since multiplying the DE on both sides can "remove" solutions.

Example

Compute a general solution to

$$y' = x\sqrt{y-1}.$$