

DY-esimerkkejä

Tavallinen DY

> $dy := x^2 \cdot y''(x) + y(x) = 0$

$$dy := x^2 \left(\frac{d^2}{dx^2} y(x) \right) + y(x) = 0 \quad (1.1)$$

> `dsolve(dy)`

$$y(x) = _C1 \sqrt{x} \sin\left(\frac{1}{2} \sqrt{3} \ln(x)\right) + _C2 \sqrt{x} \cos\left(\frac{1}{2} \sqrt{3} \ln(x)\right) \quad (1.2)$$

> `dsolve({dy, y(1) = 0, y'(1) = 2})`

$$y(x) = \frac{4}{3} \sqrt{3} \sqrt{x} \sin\left(\frac{1}{2} \sqrt{3} \ln(x)\right) \quad (1.3)$$

> `y(x)` # ratkaisukäsky ei määrittele muuttujan arvoa

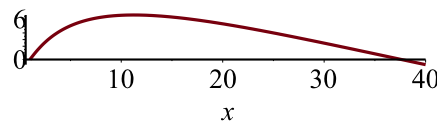
$$y(x) \quad (1.4)$$

> `assign(%%)`

> `y(x)`

$$\frac{4}{3} \sqrt{3} \sqrt{x} \sin\left(\frac{1}{2} \sqrt{3} \ln(x)\right) \quad (1.5)$$

> `plot(y(x), x = 1 .. 40)`



Numeerinen DY

> `restart :`

> `dsolve(y'(x) = sin(x*y(x)))` # ei osaa ratkaista

> `ratkaisu := dsolve({y'(x) = sin(x*y(x)), y(0) = 1}, y(x), type = numeric)`

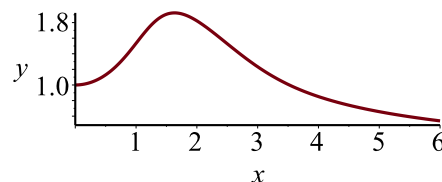
`ratkaisu := proc(x_rkf45) ... end proc` (2.1)

> `ratkaisu(1)`

`[x = 1., y(x) = 1.53410042521991]` (2.2)

> `with(plots) :`

> `odeplot(ratkaisu, [x, y(x)], x = 0 .. 6)`



DY-ryhmä

> restart :

> ryhma := x'(t) = x(t) + 2 · y(t), y'(t) = x(t)

$$\text{ryhma} := \mathbf{D(x)(t) = x(t) + 2 y(t), D(y)(t) = x(t)}$$

(3.1)

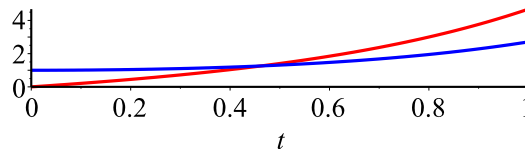
> dsolve({ryhma, x(0) = 0, y(0) = 1}, {x(t), y(t)})

$$\left\{ x(t) = -\frac{2}{3} e^{-t} + \frac{2}{3} e^{2t}, y(t) = \frac{2}{3} e^{-t} + \frac{1}{3} e^{2t} \right\}$$

(3.2)

> assign(%)

> plot([x(t), y(t)], t=0..1, color = [red, blue])



Numeerinen DY-ryhmä

> restart :

> dryhma := x'(t) = sin(y(t)), y'(t) = cos(-x(t) + t)

$$\text{dryhma} := \mathbf{D(x)(t) = \sin(y(t)), D(y)(t) = \cos(-x(t) + t)}$$

(4.1)

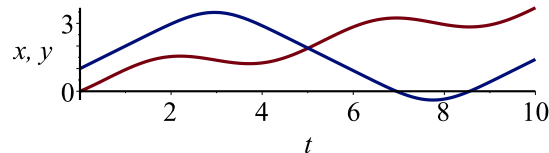
> ratkaisu := dsolve({dryhma, x(0) = 0, y(0) = 1}, type = numeric)

$$\text{ratkaisu} := \mathbf{\text{proc}(x_rkf45) \dots \text{end proc}}$$

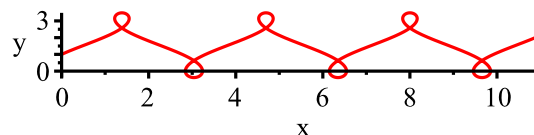
(4.2)

> with(plots) :

> odeplot(ratkaisu, [[t, x(t)], [t, y(t)]], t=0..10) # ratkaisujen kuvaajat



> odeplot(ratkaisu, [x(t), y(t)], t=0..30, numpoints = 1000)



Tämä voisi esittää kappaleen rataa xy-tasossa, jos t on aika.