Bspl.

a) $y'(t) = 0$ Ordnung 1

$y(t) = c$

Anfangsbed. (AB) $y(t_0) = y_0$

$y(t) = y_0$

b) $y''(t) = 0$ Ordnung 2

$y'(t) = c$

$y(t) = ct + c_2$

Anfb. $y(0) = 1$, $y'(0) = 2$

$y(0) = c \cdot 0 + c_2 = 1 \Rightarrow c_2 = 1$

$y(t) = ct + 1$

$y'(0) = c = 2$

$\Rightarrow y(t) = 2t + 1$

Alternativ:

Randbedingung (RB)

$y(0) = 1 \qquad y(1) = 2$

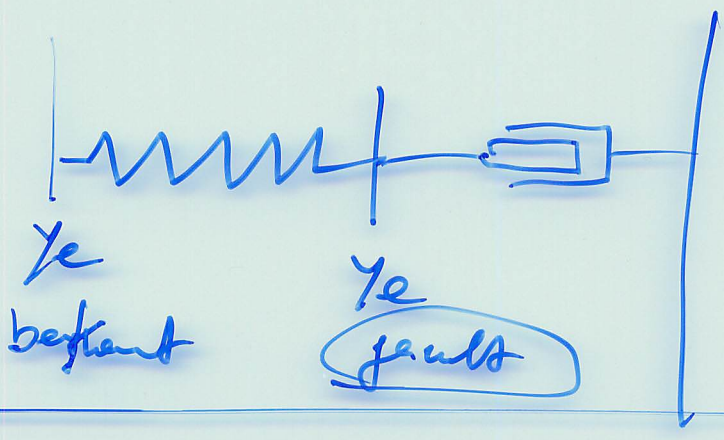
$\Downarrow$

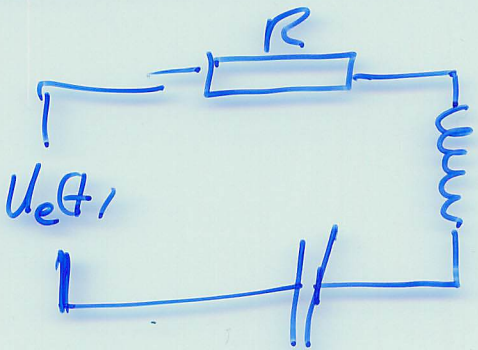
$c_2 = 1 \qquad y(t) = ct + 1$

$y(1) = c + 1 \stackrel{!}{=} 2$

$c = 1$

$y(t) = t + 1$



Golfstrom IV6 (3)

$$\frac{dT}{dt} = (1-T) - Q(T,S)/T$$

$$\frac{dS}{dt} = \gamma(1-S) - Q(T,S)/S$$

$$Q = \alpha T - \beta S$$

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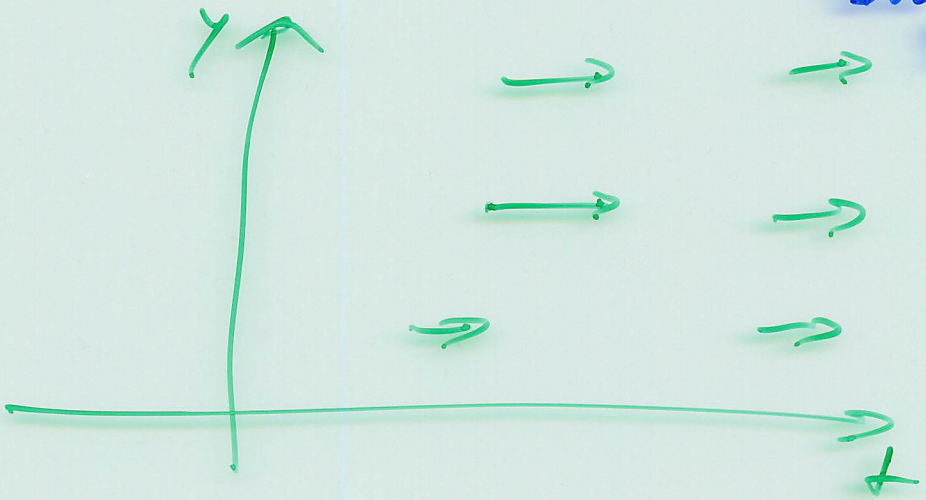
## Richtungsfeld

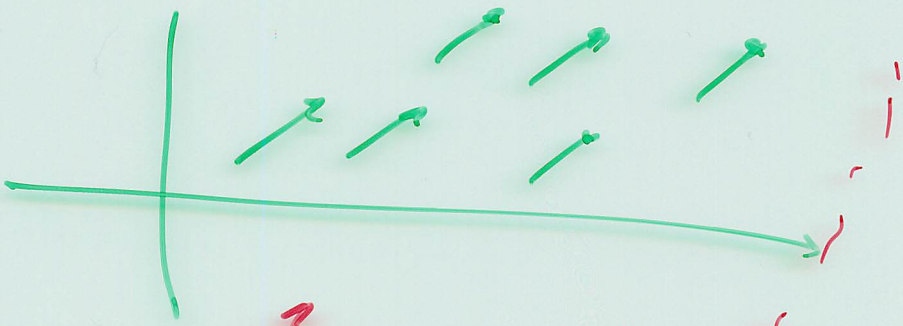
$$y'(t) = f(t, y(t))$$


$$y' = f(t, y(t)) \qquad (1, f(t,y))$$

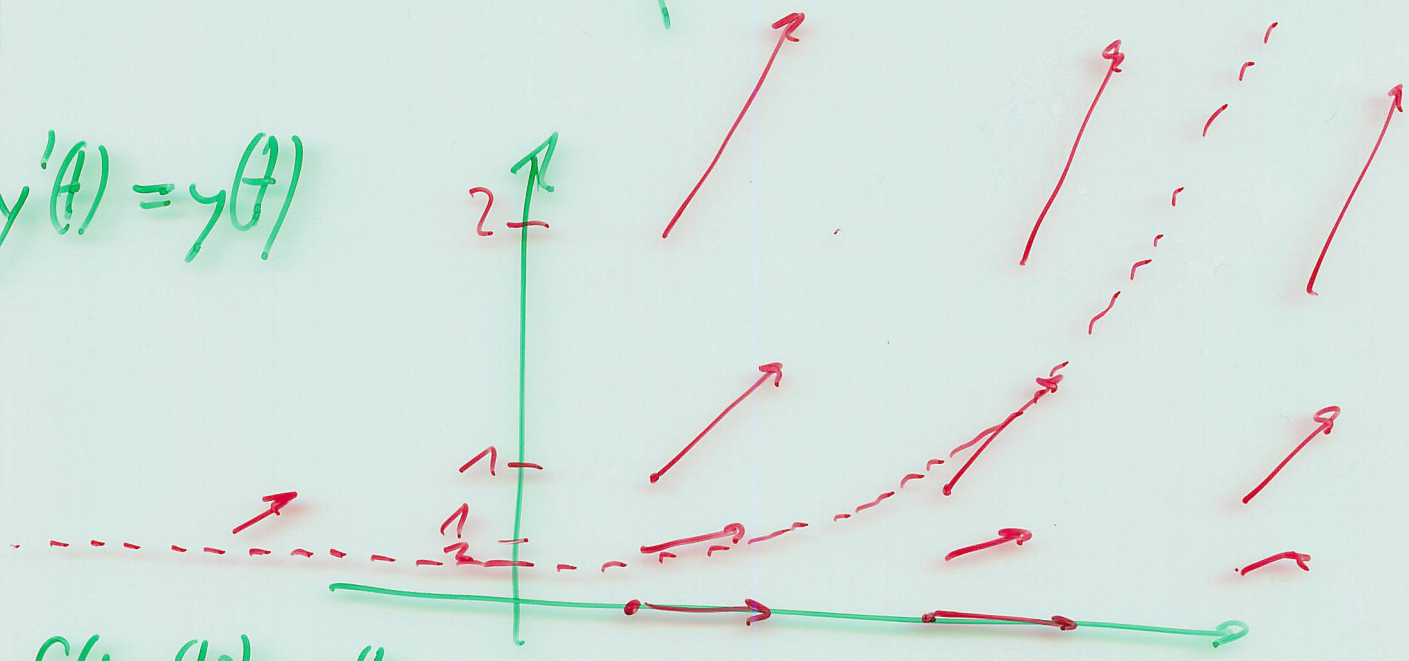
a) $y'(t) = 0$




b) $y'(t) = c > 0$



c) $y'(t) = y(t)$




$f(t, y(t)) = y(t)$

$y(t) = e^t$

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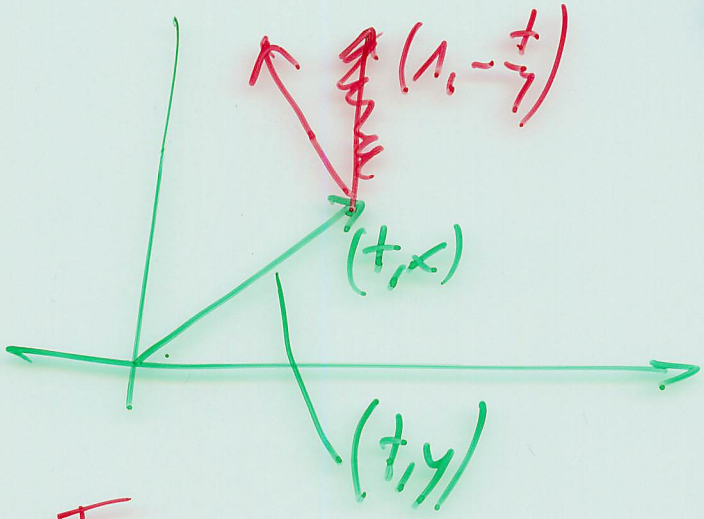
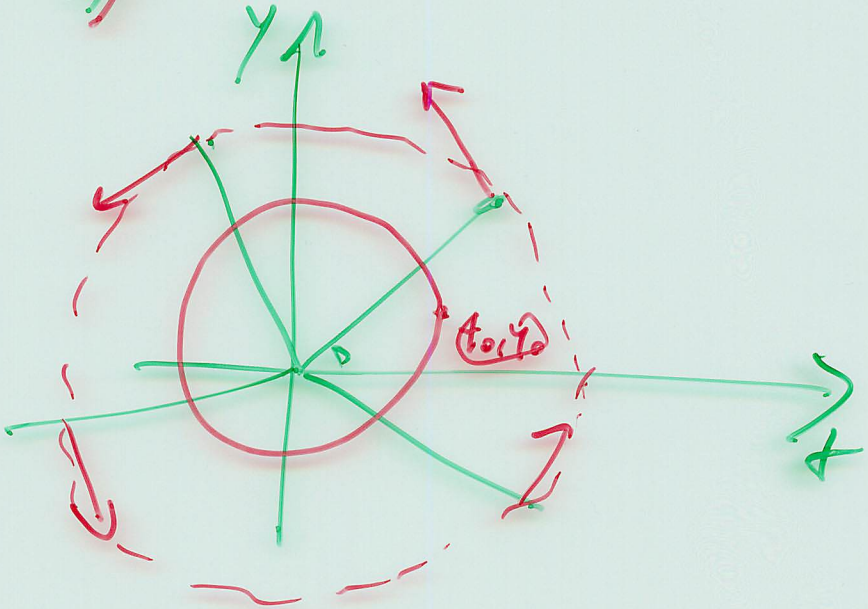
d) $y'(t) = -\frac{t}{y} = f(t, y)$ $\quad (1, -\frac{t}{y})$




$$(t,y)\cdot\left(1,-\frac{t}{y}\right)^T = 0$$




## Trennung d. Variable

$$\frac{dy}{dt} = f(t)\cdot g(y)$$ Spezialfall!

$$\frac{dy}{g(y)} = f(t)\,dt \qquad y(t_0)=y_0 \text{ AB}$$

$$\int_{y_0}^{y}\frac{dy}{g(y)} = \int_{t_0}^{t} f(t)\,dt$$

Bsp. $y'(t) = c \qquad y(t_0) = y_0$

$$dy = c\,dt$$

$$\int_{y_0}^{y} dy = \int_{t_0}^{t} c\,dt \Rightarrow y - y_0 = c\,(t - t_0)$$

Bsp. $y'(t) = y(t) \qquad y(t_0) = y_0$

$y > 0$

$$\int_{y_0}^{y} \frac{dy}{y} = \int_{t_0}^{t} dt =$$

$$\int_{y_0}^{y} d(\ln y) = \int_{t_0}^{t} dt$$

$$\ln y - \ln y_0 = t - t_0$$

$$\ln \frac{y}{y_0} = t - t_0$$

$$\frac{y}{y_0} = e^{t-t_0}$$

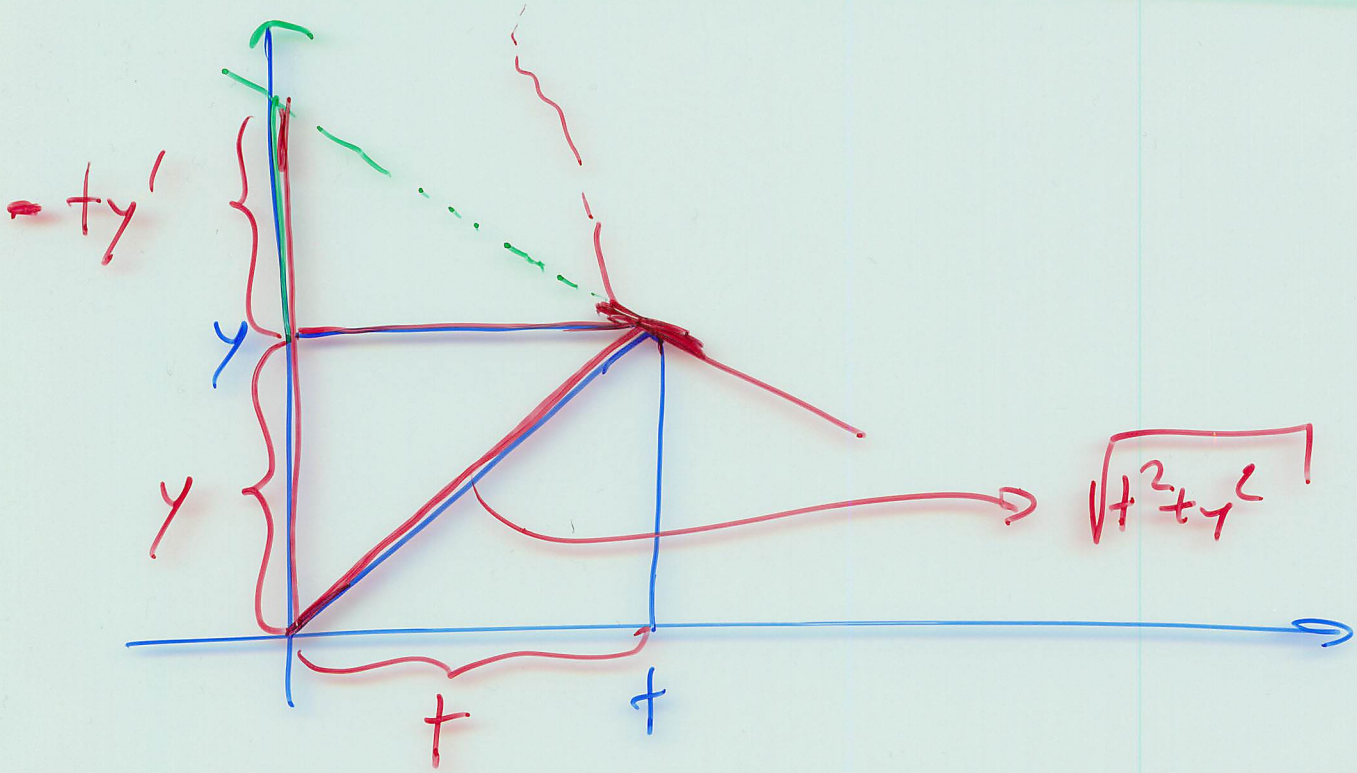
$$\boxed{y = y_0\, e^{t-t_0}}$$

Bsp $\quad y'(t) = -\frac{t}{y(t)}$

$$\int_{y_0}^{y} y\,dy = \int_{t_0}^{t} -t\,dt$$

$$\frac{y^2}{2} - \frac{y_0^2}{2} = -\left(\frac{t^2}{2} - \frac{t_0^2}{2}\right)$$

$$y^2 + t^2 = y_0^2 + t_0^2 = R_0^2$$




$$y - ty' = \sqrt{t^2+y^2} \qquad \text{ges. } y = y(t)$$

$$y' = \frac{y}{t} - \sqrt{1+\left(\frac{y}{t}\right)^2}$$