

$F_H = -mg \sin \theta$   
 $a_t = -g \sin \theta$   
 Opsiini iikla  $\theta$   
 odgandi. Ikkh de  $l \cdot \theta$   
 $s = l \cdot \theta$   
 $v = \frac{ds}{dt} = l \cdot \frac{d\theta}{dt}$   
 $a_t = \frac{dv}{dt} = l \cdot \frac{d^2\theta}{dt^2}$   
 $l \cdot \frac{d^2\theta}{dt^2} = -g \sin \theta$   
 $\theta'' = -\frac{g}{l} \cdot \sin \theta$

$\theta = \theta(t)$   
 matematiilise eynalduse hmskood m  
 gravitatsioon

12 14-12:08

ex:  $y' = y$   
 sinx, cosx:  $y'' = -y$

12 14-12:23

$y^{(n)} + a_{n-1}y^{(n-1)} + a_{n-2}y^{(n-2)} + \dots + a_1y' + a_0y = b(x)$   
 $b(x) \equiv 0 \dots$  homogeen!  
 $b(x) \neq 0 \dots$  nehomogeen!

12 14-12:41

$y' - 3y = x$   
 $y' + 3y = x$  /  $\cdot e^{3x}$   
 $(y \cdot e^{3x})' = x \cdot e^{3x}$   
 $a = e^{3x}$

$ax^2 + bx + c = 0$   
 $x^2 + \frac{b}{a}x + \frac{c}{a} = 0$   
 $(x + \frac{b}{2a})^2 - \frac{b^2}{4a^2} + \frac{c}{a} = 0$   
 $(x + \frac{b}{2a})^2 = \frac{b^2 - 4ac}{4a^2}$

12 14-12:48

$y' = a(x) \cdot y + b(x)$   
 Esime homogeeni pidiuiseon:  
 $y_h = C \cdot e^{\int a(x) dx}$   
 $\Rightarrow y = C(x) \cdot e^{\int a(x) dx}$   
 $C'(x) \cdot e^{\int a(x) dx} + C(x) \cdot a(x) \cdot e^{\int a(x) dx} = a(x) \cdot C(x) \cdot e^{\int a(x) dx} + b(x)$   
 $C'(x) \cdot e^{\int a(x) dx} = b(x)$   
 $\Rightarrow C(x) = \int b(x) \cdot e^{-\int a(x) dx} dx + K$

12 14-13:02

$Q' = -rQ$        $Q(t) = -r \cdot Q(t)$   
 $\frac{dQ}{dt} = -r \cdot Q$   
 $\frac{dQ}{Q} = -r \cdot dt$  |  $\int$   
 $\int \frac{dQ}{Q} = \int -r dt$   
 $\ln|Q| = -r \cdot t + C_1$  |  $e^{\dots}$   
 $|Q| = e^{-r \cdot t} \cdot e^{C_1}$   
 $Q = e^{-rt} \cdot C$

12 14-13:05