Übung 7 - Aufgabe 2

$m = 20\,kg$
$\Delta y = 5\,cm$
$F = ?$

$\omega = \sqrt{\frac{k}{m}}$

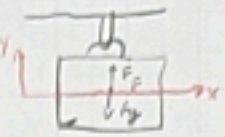
$\Sigma \vec{F} = 0$

$\downarrow: \Sigma F_y = 0$

$= mg + k\Delta y = 0$

$\Leftrightarrow \Delta y\, k = mg$

$\Leftrightarrow k = \frac{mg}{\Delta y} = \frac{20 \cdot 9{,}81\ m/s^2}{0{,}05\,m} = 3924\ N/m$



$\omega = \sqrt{\frac{mg}{\Delta y \cdot m}} = \sqrt{\frac{g}{\Delta y}}$

$F = k \cdot x \Leftrightarrow k = \frac{F}{x} = \frac{N}{m}$

$f = \frac{\omega}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{g}{\Delta y}} = \frac{1}{2\pi}\sqrt{\frac{9{,}81\ m/s^2}{0{,}05\,m}} = 2{,}22\,Hz$

Übung 7 - Aufgabe 3

a)

$v_0 = 0{,}30\ m/s$

$\Delta y = 8\,cm - 5\,cm = 3\,cm$

$\Sigma \vec{F} = 0$

$k \cdot \Delta y - mg = 0$

$\Leftrightarrow k = \frac{mg}{\Delta y}$

$y(t) = C \cdot \cos(\omega_0 t - \varphi)$

$v(t) = -C \cdot \omega_0 \cdot \sin(\omega_0 t - \varphi)$

$v(t=0) = 0{,}3\,m/s$

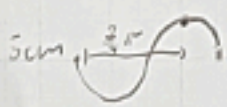
$\omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{\frac{mg}{\Delta y}}{m}} = \sqrt{\frac{g}{\Delta y}}$

$|C \cdot \omega_0| = 0{,}3$

$|C| = \frac{0{,}3}{\omega_0} = \frac{0{,}3}{\sqrt{\frac{g}{\Delta y}}} = 0{,}3\sqrt{\frac{\Delta y}{g}} = 0{,}3\sqrt{\frac{0{,}03\,m}{9{,}81\ m/s^2}} = 1{,}7\,cm$

$h = y_{ges} + C = 5\,cm + 1{,}7\,cm = 6{,}7\,cm$

b)



$T = \sqrt{\frac{2\pi}{\omega}} = 2\pi\sqrt{\frac{\Delta y}{g}}$

$t = \frac{3}{4} \cdot \frac{2\pi}{\omega} = \frac{6\pi}{4\sqrt{\frac{g}{\Delta y}}} = \frac{3}{2}\sqrt{\frac{\Delta y}{g}} = 0{,}26\,s$

c)

$\omega_0 = \sqrt{\frac{g}{\Delta y}} = \sqrt{\frac{9{,}81\ m/s^2}{0{,}03\,m}} = 18{,}08\,Hz$

$C = 8 - 5 = 3\,cm$

$v_0 = C \cdot \omega_0 = 0{,}03\,m \cdot 18{,}08\,Hz = 0{,}54\ m/s$