Fyzika LS 2014/2015 – 1. 10-minútovka – riešenia úloh

Pásavec

h = 0,544 m, t = 0,200 s, v_0 = ? m/s, v_H = ? m/s, h_{MAX} = ? m

v_0 ... $h = v_0 \cdot t - 1/2 \cdot g \cdot t^2 \Rightarrow (h + 1/2 \cdot g \cdot t^2) / t = v_0 \Rightarrow v_0 = [0{,}544\ \text{m} + 1/2 \cdot 10\ \text{m/s}^2 \cdot (0{,}2\ \text{s})^2] / 0{,}2\ \text{s}$

$v_0 \approx$ <u>3,72 m/s</u>

v_H ... $v_H = v_0 - g \cdot t = 3{,}72\ \text{m/s} - (10\ \text{m/s}^2 \cdot 0{,}2\ \text{s}) = 3{,}72\ \text{m/s} - 2\ \text{m/s} =$ <u>1,72 m/s</u>

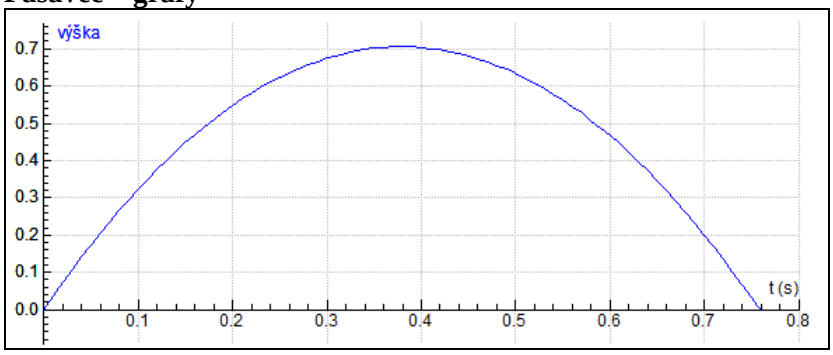
h_{MAX} ... $h = v_0 \cdot t - 1/2 \cdot g \cdot t^2$

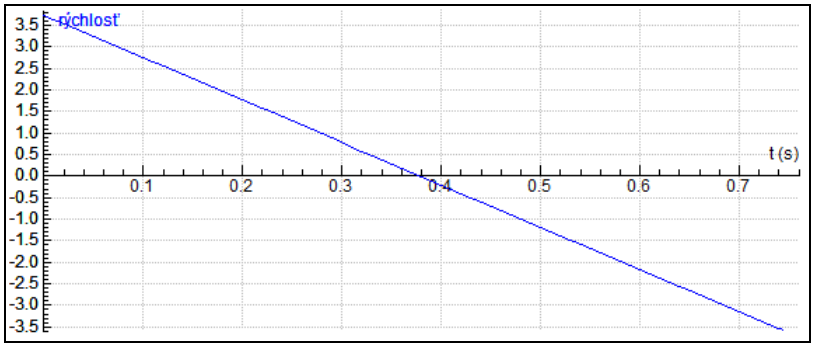
$v = v_0 - g \cdot t$, $v_{HMAX} = 0$ m/s $\Rightarrow v_0 = g \cdot t \Rightarrow t = v_0 / g$

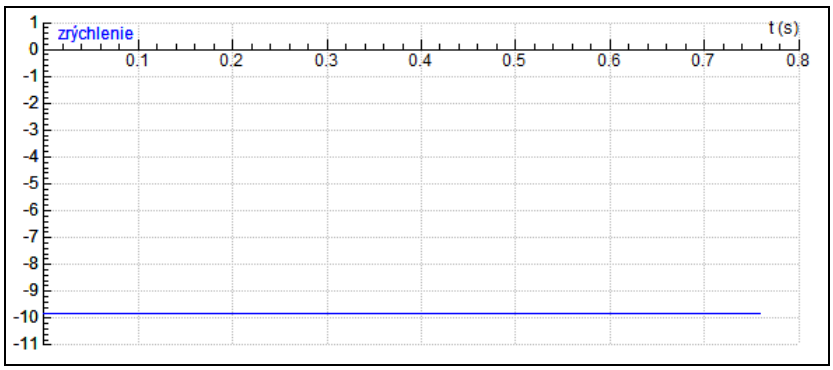
$h_{MAX} = (v_0 \cdot v_0) / g - 1/2 \cdot g \cdot (v_0 / g)^2 \Rightarrow h_{MAX} = v_0^2 - (g \cdot v_0^2) / (2 \cdot g^2) \Rightarrow h_{MAX} = v_0^2 / g - v_0^2 / 2g$

$h_{MAX} = v_0^2 / 2g \Rightarrow h_{MAX} = (3{,}72\ \text{m/s})^2 / (2 \cdot 10\ \text{m/s}^2) \approx$ <u>0,69 m</u>

Pásavec – grafy







Lúčny koník

a), b), c) postup pri riešení príkladu je rovnaký ako v predošlej úlohe, akurát sú tu rozdiely v niektorých číslach... výsledky: v_0 = 3,26 m/s, v_H = 1,76 m/s, h_{MAX} = 0,53 m

d) to isté platí aj pre grafy – tvarovo sú rovnaké, líšia sa len v číslach

Lopta 0 metrová

h_0 = 0 m, h_{MAX} = 50 m, v_0 = ? m/s, t_{LETU} = ? s

v_0 ... $h = v_0 \cdot t - 1/2 \cdot g \cdot t^2$

$v = v_0 - g \cdot t$, $v_{HMAX} = 0$ m/s => $v_0 = g \cdot t$ => $t = v_0 / g$

$h_{MAX} = (v_0 \cdot v_0) / g - 1/2 \cdot g \cdot (v_0 / g)^2$ => $h_{MAX} = v_0^2 - (g \cdot v_0^2) / (2 \cdot g^2)$ => $h_{MAX} = v_0^2 / g - v_0^2 / 2g$

$h_{MAX} = v_0^2 / 2g$ => $h_{MAX} \cdot 2g = v_0^2$ => $v_0 = \sqrt{h_{MAX} \cdot 2g} = \sqrt{50\ \text{m} \cdot 2 \cdot 10\ \text{m/s}^2} = \sqrt{1000}$ m/s

$v_0 \approx$ <u>31,62 m/s</u>

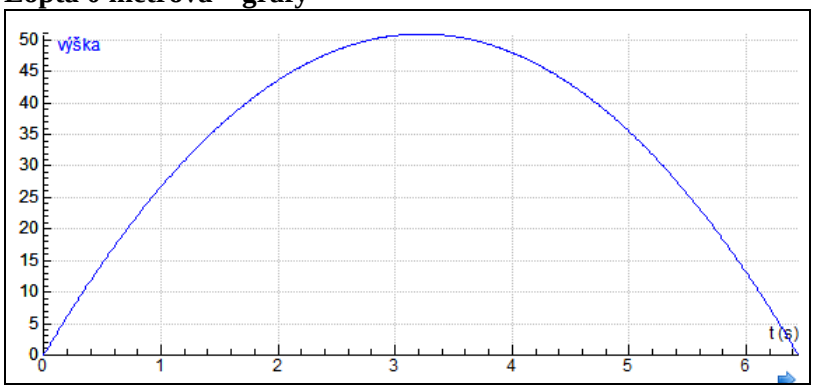
t_{LETU} ... $v = v_0 - g \cdot t$, $v_{HMAX} = 0$ m/s => $v_0 = g \cdot t$ => $t = v_0 / g = t_{NAHOR}$

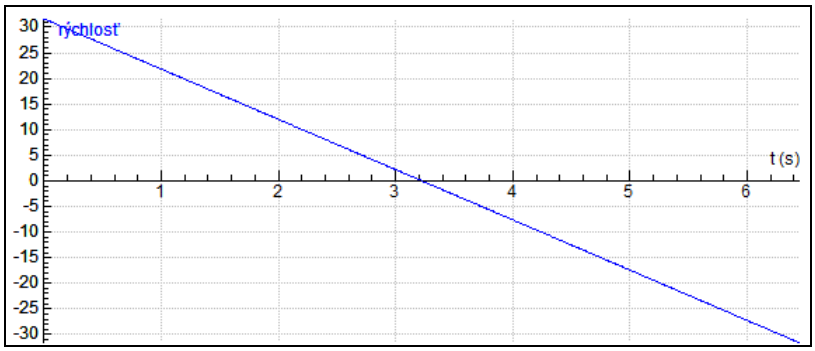
$h = 1/2 \cdot g \cdot t^2$ => $2h / g = t^2$ => $t = \sqrt{2h / g} = t_{NADOL}$

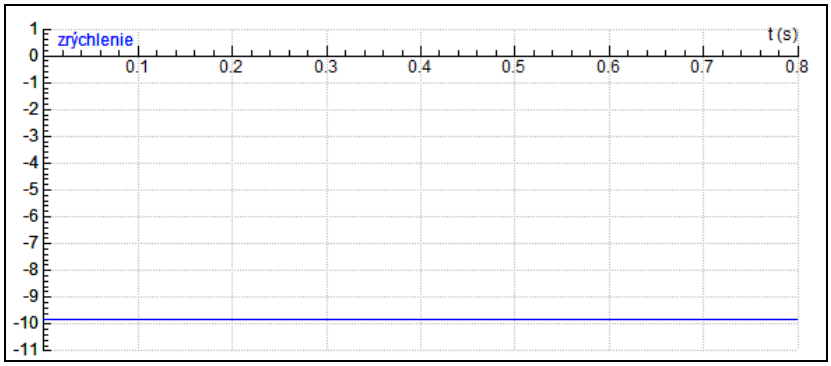
$t_{LETU} = t_{NAHOR} + t_{NADOL} = v_0 / g + \sqrt{2h / g} = 31{,}62\ \text{m/s} / 10\ \text{m/s}^2 + \sqrt{2 \cdot 50\ \text{m} / 10\ \text{m/s}^2}$

t_{LETU} = 3,162 s + 3,162 s = <u>6,324 s</u>

Lopta 0 metrová – grafy







Lopta 1 metrová

h_0 = 1 m, h_{MAX} = 49 m, v_0 = ? m/s, t_{LETU} = ? s

v_0 ... $h = h_0 - v_0 \cdot t - 1/2 \cdot g \cdot t^2$

$v = v_0 - g \cdot t$, $v_{HMAX} = 0$ m/s => $v_0 = g \cdot t$ => $t = v_0 / g$

$h_{MAX} = h_0 + (v_0 \cdot v_0) / g - 1/2 \cdot g \cdot (v_0 / g)^2$ => $h_{MAX} = h_0 + v_0^2 - (g \cdot v_0^2) / (2 \cdot g^2)$

$h_{MAX} = h_0 + v_0^2 / g - v_0^2 / 2g \Rightarrow h_{MAX} = h_0 + v_0^2 / 2g \Rightarrow (h_{MAX} - h_0) \cdot 2g = v_0^2$

$v_0 = \sqrt{(h_{MAX} - h_0) \cdot 2g} = \sqrt{(49\text{ m} - 1\text{ m}) \cdot 2 \cdot 10\text{ m/s}^2} = \sqrt{960}\text{ m/s} \Rightarrow v_0 \approx \underline{30{,}98\text{ m/s}}$

t_{LETU} ... $v = v_0 - g \cdot t$, $v_{HMAX} = 0$ m/s => $v_0 = g \cdot t$ => $t = v_0 / g = t_{NAHOR}$

$h = 1/2 \cdot g \cdot t^2$ => $2h / g = t^2$ => $t = \sqrt{2h / g} = t_{NADOL}$

$t_{LETU} = t_{NAHOR} + t_{NADOL} = v_0 / g + \sqrt{2h / g} = 30{,}98\text{ m/s} / 10\text{ m/s}^2 + \sqrt{2 \cdot 49\text{ m} / 10\text{ m/s}^2}$

$t_{LETU} = 3{,}098\text{ s} + 3{,}130\text{ s} = \underline{6{,}228\text{ s}}$

Lopta 1 metrová – grafy