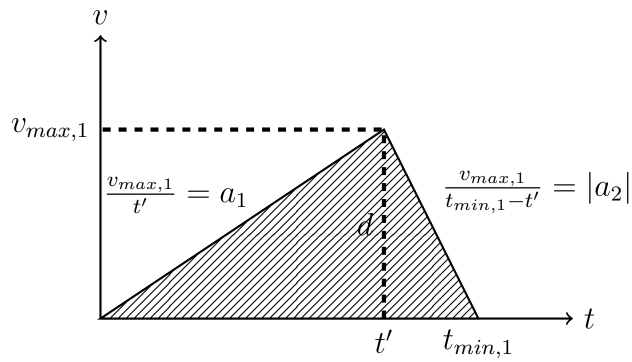
Klassische Physik 1 Hausaufgaben Blatt Nr. 0

Jun Wei Tan,* Saed Othman, and Mattis Liebermann

Julius-Maximilians-Universität Würzburg

(Dated: October 31, 2023)

a. *Aufgabe 1.1*



(a)

Man löst die Gleichungen

$$\frac{1}{2}(v_{max,1})(t_{min,1}) = d \tag{1}$$

$$v_{max,1} = a_1 t' \tag{2}$$

$$v_{max,1} = (t' - t_{min,1})a_2 \tag{3}$$

Aus (2) folgt $t' = v_{max,1}/a_1$. Wir setzen das in (3) ein. Es ergibt sich

$$v_{max,1} = \left(\frac{v_{max,1}}{a_1} - t_{min,1}\right) a_2.$$

Daraus folgt:

$$v_{max,1}\left(1 - \frac{a_2}{a_1}\right) = -t_{min,1}a_2.$$

(b) Noch einmal setzen wir das in (1) ein:

$$\frac{1}{2}\left[-t_{min,1}a_2\left(1-\frac{a_2}{a_1}\right)^{-1}\right](t_{min,1}) = d.$$

Die Lösung ist

$$t_{min,1} = \boxed{\left[-\frac{2d}{a_2}\left(1-\frac{a_2}{a_1}\right)\right]^{1/2}}.$$

* jun-wei.tan@stud-mail.uni-wuerzburg.de

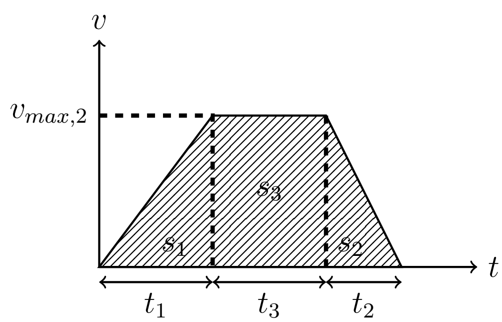
Aus (1) folgt

$$v_{max,1} = \frac{2d}{t_{mn,1}}.$$

Also

$$v_{max,1} = \boxed{\left[-\frac{1-\frac{a_2}{a_1}}{2a_2 d}\right]^{-1/2}}.$$

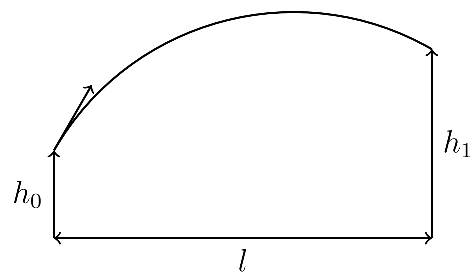
(c)



Es gilt

$$\begin{aligned}
t_1 =& \frac{v_{max,2}}{a_1} \\
t_2 =& -\frac{v_{max,2}}{a_2} \\
s_1 =& \frac{1}{2}a_1 t_1^2 = \frac{v_{max,2}^2}{2a_1} \\
s_2 =& \frac{1}{2}v_{max,2}t_2 = -\frac{v_{max,2}^2}{2a_2} \\
s_3 =& v_{max,2}t_3 = d - s_1 - s_2 \\
t_3 =& \frac{d - s_1 - s_2}{v_{max,2}} \\
=& \frac{d}{v_{max,2}} - \frac{v_{max,2}}{2a_1} + \frac{v_{max,2}}{2a_2} \\
t_{min,2} =& t_1 + t_2 + t_3 \\
=& \frac{d}{v_{max,2}} + \frac{v_{max,2}}{2a_1} - \frac{v_{max,2}}{2a_2}
\end{aligned}$$

b. Aufgabe 1.2



$$x = v_0 t \cos\theta$$
$$y = v_0 t \sin\theta - \frac{1}{2} g t^2$$
$$y = x \tan\theta - \frac{g x^2}{2 v_0^2 \cos^2\theta}$$

Wir brauchen $y(l) = h_1 - h_0$, oder

$$h_1 - h_0 = l \tan\theta - \frac{g l^2}{2 v_0^2 \cos^2\theta}.$$

Daraus folgt

$$v_0^2 = \frac{g l^2}{2\cos^2\theta\,(l\tan\theta - (h_1 - h_0))}.$$

$l = h_1 = 1$ m, $h_0 = 0$ m