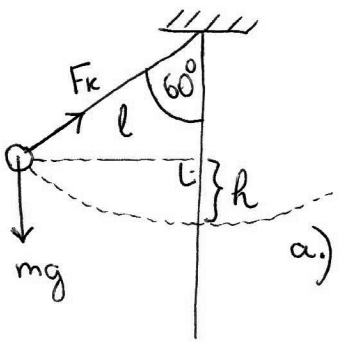
19.) $\vartheta_0 = 60°$ a.) $a^2(\cos\vartheta) = ?$ b.) $\frac{a_{min}}{g} = ?$ $\vartheta = ?$



$$a = \sqrt{a_t^2 + a_n^2} \qquad a_n = \frac{v^2}{l}$$

$$E_M = E_p + E_k \qquad E_p = mgh \qquad E_k = \frac{1}{2}mv^2$$

a.) $a_t = g\sin\vartheta$

$h = l - l\cos\vartheta = l(1-\cos\vartheta)$

$mgh_0 = mgh + \frac{1}{2}mv^2 \rightarrow v^2 = 2g(h_0 - h) = 2g(l - l\cos\vartheta_0 - l + l\cos\vartheta)$

$v^2 = 2gl(\cos\vartheta - \cos\vartheta_0)$

$a_n = \frac{v^2}{l} = 2g(\cos\vartheta - \cos\vartheta_0)$

$a^2 = a_t^2 + a_n^2 = g^2\sin^2\vartheta + 4g^2(\cos\vartheta - \cos\vartheta_0)^2 = \dots$

$a^2 = g^2 + 4g^2\cos^2\vartheta_0 + 3g^2\cos^2\vartheta - 8g^2\cos\vartheta_0\cos\vartheta$

$\Downarrow$

$a^2 = f(\cos\vartheta)$

b.)

$$\frac{da^2}{d\vartheta} = 3g^2 \cdot 2\cos\vartheta(-\sin\vartheta) - 8g^2\cos\vartheta_0(-\sin\vartheta) = 0$$

ϑ_1: $\sin\vartheta_1 = 0$

$\vartheta_1 = 0$

ϑ_2: $6g^2\cos\vartheta_2 - 8g^2\cos\vartheta_0 = 0$

$\cos\vartheta_2 = \frac{4}{3}\cos\vartheta_0$

egyik minimum, másik maximum

Behelyettesítve eldönteni...