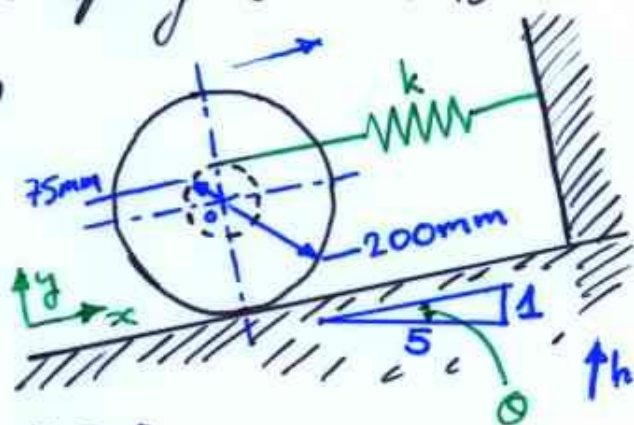


EXAMPLE 6/142

G6

10kg double wheel, radius of gyration  $k_o = 125\text{mm}$

Spring stiffness  $k = 600\text{N/m}$ . Spring connects to wheel by cord WRAPPED AROUND inner hub. When spring is stretched 225mm, wheel is released. find max vel of O



WHAT is  $\theta$ ?  $\theta = \tan^{-1}(\frac{1}{5}) = 11.31^\circ$

$$\Rightarrow \sin \theta = 0.1961 = \frac{1}{\sqrt{1^2 + 5^2}} \text{ (alternative)}$$

if wheel moves... how is potential Energy changed  
gravity:  $\Delta V_g = mg\Delta h = mgx \sin \theta$

spring:  $\Delta V_e = \frac{1}{2}k(l_i^2 - l_f^2)$   $l$  being spring extension.

Need to be careful. WHEEL moves distance  $x$  in positive  $x$  direction  $\Rightarrow$  SPRING RELAXES  
HOW MUCH?

2 components: translation ...  $x$   
UNWINDING ...  $r\theta$

(look at  $r\theta$  ...  $r = 0.075\text{m}$

$$\theta = \frac{x}{0.200} \leftarrow \text{outer radius}$$

$\therefore$  total relaxation is

$$x + \frac{0.075x}{0.200}$$

$$= \left( \frac{0.275}{0.200} \right) x$$