Your TA, Section # and Section time:

Your name:

Cornell TAM/ENGRD 2030

No calculators, books or notes allowed.

3 Problems, 90 minutes (+ up to 90 minutes overtime)

Catch-all Makeup Prelim

May 7, 2011

How to get the highest score?

Please do these things:

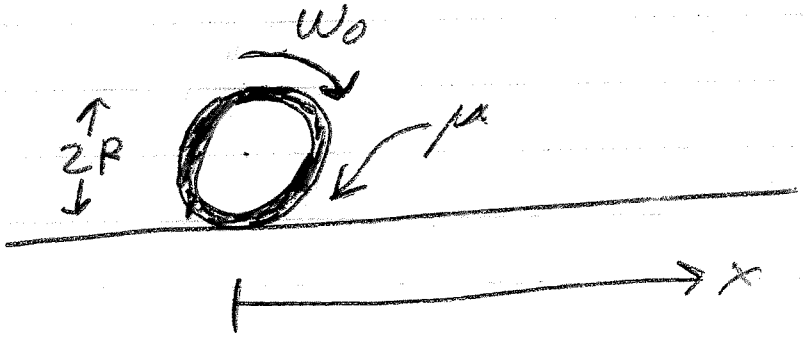
- Draw **Free body diagrams** whenever force, moment, linear momentum, or angular momentum balance are used.
- Use correct **vector notation**.
- A+ Be (I) neat, (II) clear and (III) well organized.
- TIDILY REDUCE and box in your answers (Don't leave simplifyable algebraic expressions).
- >> Make appropriate `Matlab code` clear and correct.
  You can use shortcut notation like "$T_7 = 18$" instead of, say, "`T(7) = 18`".
  Small syntax errors will have small penalties.
- Clearly **define** any needed dimensions $(\ell, h, d, \ldots)$, coordinates $(x, y, r, \theta \ldots)$, variables $(v, m, t, \ldots)$, base vectors $(\hat{\imath}, \hat{\jmath}, \hat{e}_r, \hat{e}_\theta, \hat{\lambda}, \hat{n} \ldots)$ and signs $(\pm)$ with sketches, equations or words.
- **Justify** your results so a grader can distinguish an informed answer from a guess.
- If a problem seems ***poorly defined***, clearly state any reasonable assumptions (that do not oversimplify the problem).
- ≈ Work for **partial credit** (from 60–100%, depending on the problem)
  - Put your answer is in terms of well defined variables even if you have not substituted in the numerical values.
  - Reduce the problem to a clearly defined set of equations to solve.
  - Provide Matlab code which would generate the desired answer (and explain the nature of the output).
- **Extra sheets.** Put your name on each extra sheet, fold it in, and refer to it at the relevant problem. Note the last page is **blank** for your use. Ask for more extra paper if you need it.

Problem 10: ____/25

Problem 11: ____/25

Problem 12: ____/25

1. A uniform hoop spins and then is dropped onto a horizontal surface. The hoop spins and slides for a while and eventually ends up in pure rolling.

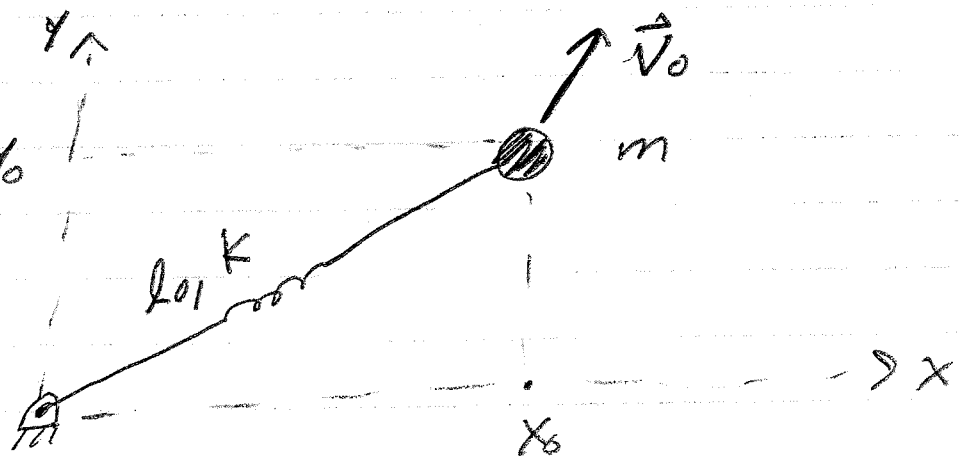


a) When the cylinder eventually rolls what is its velocity (vel. of C.O.M.)

b) What, then, is $\vec{\omega}$?

c) How far does it travel before it enters pure rolling?

2) Neglect gravity. 2D.



Given

$m = 3\ kg$

$l_0 = 2\ m$

$K = 100\ N/m$

$\vec{r}_0 = 5m\,\hat{i} + 4m\,\hat{j}$

$\vec{V}_0 = 6\ m/s\ \hat{j}$

Write matlab code to find $x(t=3s)$.

3) In terms of m_A, m_B & g find the tension in cable AB.