

Introduction

"Music is a hidden practice of the soul, which does not know that it is doing mathematics."

-- Leibniz

Networks Down Again

- Connectivity to the Mechanics pages has been sporadic since Monday afternoon
- My email has been unavailable since Monday afternoon
 - Now up sporadically

Medical Science Student Union

Info session on volunteering in the Philippines:

Friday, October 27, 3 PM, MS3171

Bake sale:

Monday, October 20, 10 – 5 PM, Sydney Smith lobby

FREE PHY 138 HELP SESSION

October 24, 3:00 – 5:00 pm, SS1072

October 26, 1:00 – 2:00 pm, SS2119

For more information, visit our website at
<http://utpt.sa.utoronto.ca>

URGENT! NEEDS YOU!

Project: Universal Minds

VOLUNTEER TUTORS NEEDED

- tutor a high school student for one hour a week
- add volunteer experience to your resume
- get a certificate of recognition from the Dean of Arts & Science
- feel good on the inside

Pick up an application form or contact us to get more information:

- Office: **SS 1068**
- Web site: assu.ca
- Phone: **416-978-4903**
- E-mail: students.assu@utoronto.ca



Test

- Tuesday, October 31, 6:10 – 7:30 PM
- Locations:
 - Go to the PHY138 (not Mechanics) page
 - Click on Test 1
- Reminder:
 - Monday's Class will be a test review
 - The PowerPoint will be available via the summary for today's class

Test Aids

- Closed book
- You must bring:
 - A soft-lead pencil
 - Your student card
- You may bring:
 - A calculator without text-storage or communication capability
 - A single 8 ½ x 11 inch sheet of paper on which you have written anything that you wish
- We will supply any needed constants

Test Format

- 8 Multiple-Choice Questions
 - Worth 8 marks each
 - Full credit for the correct answer
 - No credit or penalty for blank or wrong answers
- 1 Long-Answer Question
 - 5 Parts
 - Some partial credit may be given for some parts: clearly show your work and reasoning

Studying for Tests

- Testing for your knowledge of facts: the “last minute cram” can work
- Testing for your understanding and ability to apply concepts: the “last minute cram” is proven to **not** work

For the PHY138 Test, get a good night's sleep Monday night.

At some point well before the test starts, stop studying.

Doing Well on the Test

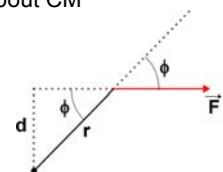
- You are likely to not be getting as many questions correct as your are used to
- Being calm and confident allows you to do your best
 - “Don't worry, by happy,” – Bobby McFerrin
- Be sure to answer the question being asked
 - Often we see students answer a question that has not been asked!

Last Time 1/2

- Power
- Metabolism
 - Basal: “resting”
 - Thermal Equilibrium
 - Allometry: $BMR \approx m^{2/3}$
 - Expt: $BMR \approx m^{3/4}$
 - Is the circulatory system *fractal*?
- Rotating Rigid Body: ω and α same for every point of the body

Last Time 2/2

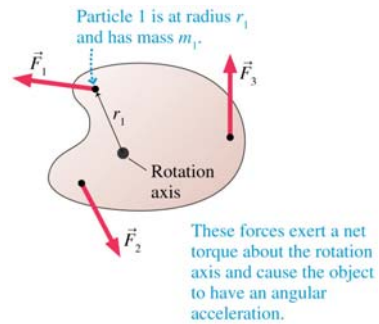
- Center of Mass (CM)
 - Unconstrained: rotates about CM
 - $x_{cm} = 1/M \sum(m_i x_i)$
- Torque τ
 - $r F_t$
 - $r F \sin(\phi)$
 - $d F$
- Gravitational torque: treat the entire mass as being at the center of mass



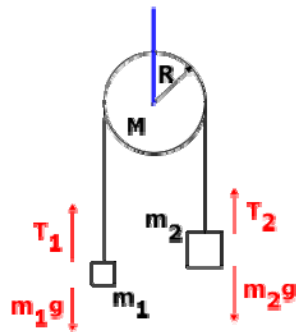
Today

- Rotational Dynamics
 - Moment of Inertia
- Equilibrium
 - Force on the leg
 - Using a cane
- Rotational Energy
- Angular Velocity Vector

Figure 13.24



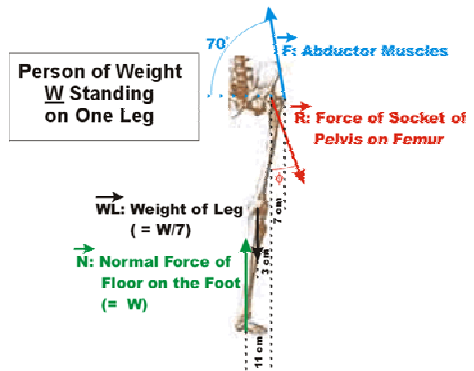
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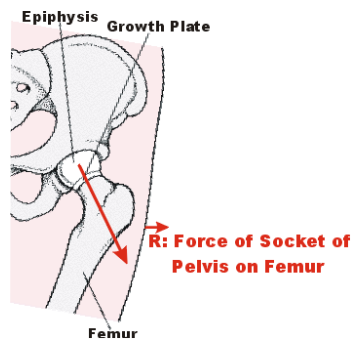
$$M = 0$$

$$a = (m_2 - m_1)g / (m_1 + m_2)$$

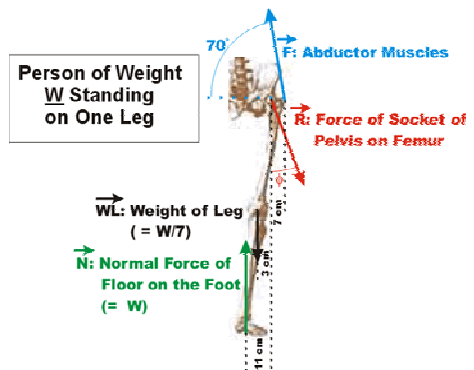
Forces on the leg



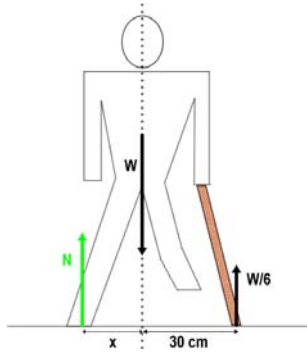
Force on Femoral Epiphysis



Forces on the leg



Cane: Opposite Side



Use of a Cane

	Force of Abductor on Trochanter	Force of Socket on Epiphysis
No Cane	1.6 W	2.4 W
Cane Same Side	1.3 W	2.0 W
Cane Opposite Side	0.6 W	1.3 W

Direction of Angular Velocity Vector

