Welcome back to Physics 215

Today's agenda:

- *Pseudoscience*
- *Work and Potential Energy*
- *Power*

Midterm 2

- This Thursday, October 24th.
- In class.
- Covers mainly weeks 5-8, though there will be some stuff from weeks 1-4 you need to retain, of course
- Forces through potential energy and the work-energy theorem.

Ask a physicist

- "*I've seen people online, including some famous ones, saying they believe the earth is a flat disk instead of a globe and I was wondering if you could somehow prove the earth is not flat.*"
- *https://theflatearthsociety.org/home/*
- *https://www.youtube.com/watch?v=1gHbwT_R9t0*
- First, the science: how to prove the earth is not flat

More nuanced issues:

- What does my audience accept as truth?
  – What does my audience accept as valid methods for finding the truth?
  – What does my audience believe about the scientists who do the research?
- What types of arguments are persuasive?
- https://curiosity.com/topics/motivated-reasoning-is-why-you-cant-win-an-argument-using-facts-curiosity/
- https://www.youtube.com/watch?v=W-xMj0LWglM
- https://www.youtube.com/watch?v=xo_Z8eXZkmg

Pseudoscience Extra credit

- Write a 1-page report:
  - (2pts)Describe a pseudoscience myth. Cite at least 3 primary or secondary sources (websites, news articles, etc.) with information about the myth and the audience who believes the myth.
  - (2pts)Use the concept of motivated reasoning to discuss what underlying concepts, allegiances, and beliefs might make a person more likely to want to believe in the myth
- Video record yourself delivering a two-minute "rebuttal" of the myth. The strength of the rebuttal will be judged on:
  - (1 pts) tone: not condescending
  - (1 pts) motivated reasoning: does it acknowledge why a reasonable person might believe the myth?
  - (1pts) effective arguments: does the response use evidence and arguments that would be persuasive to such a person?
- Due by Dec 1st.
- Worth up to 7 extra points on final exam.

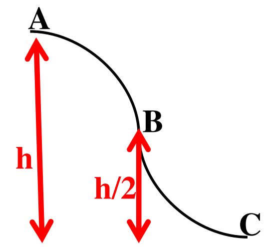
Recall: Gravitational Potential Energy

For an object of mass m near the surface of the earth:

$$U_g = mgh$$

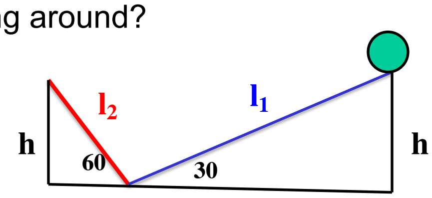
- h is height above arbitrary reference line
- Measured in Joules -- J (like kinetic energy)

SG If the velocity at B is v, then what is the velocity at C?



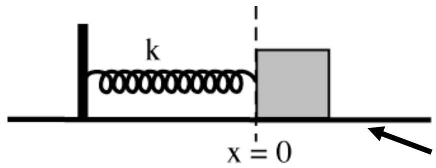
A. 2v
B. v
C. sqrt(2) v
D. v/sqrt(2)
E. None of the above

SG: Starting from a height h, a ball rolls down a frictionless shallow ramp of length l_1 = h/sin(30) with an angle 30 degrees, and then up a steep ramp of height h with angle 60 degrees and length l_2 = h/sin(60). How far up the steep ramp does the ball go before turning around?



1. ½ l_2
2. l_1
3. l_1 sin(60)/sin(30)
4. l_2
5. None of the above

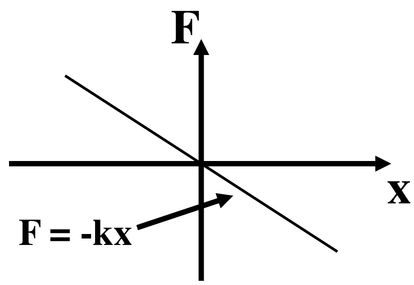
Springs -- Elastic potential energy



frictionless table

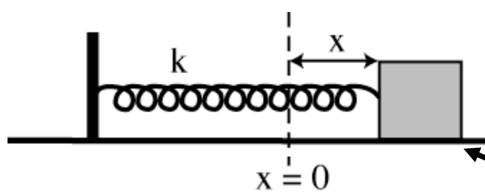
Force F = -kx (Hooke's law)

Area of triangle lying under straight line graph of F *vs*. x = (1/2)(+/-x)(-/+kx)



$$\mathbf{U_s = (1/2)kx^2}$$

(Horizontal) Spring



frictionles s table

- x = displacement from relaxed state of spring

- Elastic potential energy stored in spring: $\mathbf{U_s = (1/2)kx^2}$

$$\mathbf{(1/2)kx^2 + (1/2)mv^2 = constant}$$

SG A 0.5 kg mass is attached to a spring on a horizontal frictionless table. The mass is pulled to stretch the spring 5.0 cm and is released from rest. When the mass crosses the point at which the spring is not stretched, x = 0, its speed is 20 cm/s. If the experiment is repeated with a 10.0 cm initial stretch, what speed will the mass have when it crosses x = 0 ?

1. 40 cm/s
2. 0 cm/s
3. 20 cm/s
4. 10 cm/s

Recall: Work - Kinetic Energy Theorem

$$W_{net} = \Delta K = K_f - K_i$$

The *net work* done on an object is equal to the *change in kinetic energy* of the object.

Power

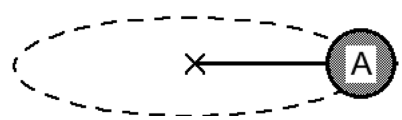
Power = Rate at which work is done

$$\text{Average power} = \frac{W}{\Delta t}$$

$$\text{Inst. power} = \lim_{\Delta t \to 0} \frac{W}{\Delta t}$$

Units of power:

SG A ball is whirled around a horizontal circle at constant speed.



If air drag forces can be neglected, the power expended by the hand is:

A. positive
B. negative
C. zero
D. “Can’t tell.”

SG A sports car accelerates from zero to 30 mph in 1.5 s. How long does it take to accelerate from zero to 60 mph, assuming the power (=$\Delta W / \Delta t$) of the engine to be constant?

(Neglect losses due to friction and air drag.)

A. 2.25 s
B. 3.0 s
C. 4.5 s
D. 6.0 s

Sample question: A 5.00-kg package slides 1.50 m down a long ramp that is inclined at 12.0° below the horizontal. The coefficient of kinetic friction between the package and the ramp is $\mu_k = 0.310$. Calculate: (a) the work done on the package by friction; (b) the work done on the package by gravity; (c) the work done on the package by the normal force; (d) the total work done on the package. (e) If the package has a speed of 2.20 m/s at the top of the ramp, what is its speed after sliding 1.50 m down the ramp?