Week 2 - #2

Oscillations (I)

LIGO

Foucault pendulum , Wikipedia commons

| Today: Ch 3.1-3.5 | Next Class: Ch 3.6-3.8 |

Ji-hoon Kim (Seoul National University)

Classical Mechanics I (Spring 2026): Quiz #3

— [open book and open note, but no cellphone or laptop, drop it off as you leave the class] —

Please write down your name and student ID in the top right corner. (0.0 pt: no paper found with your name / 0.5 pt: paper found with your name and some answers / 1.0 pt: good answers)

1. Thornton & Marion, Problem 3-7. (Note that the body is only partially submerged. According to Archimedes' Principle, buoyancy on a floating body is the weight of the fluid displaced by it.)

2. Model the equation of motion of what you see below. Qualitatively and/or mathematically describe what is going on here. The movie repeats itself every ~1.5 minutes.
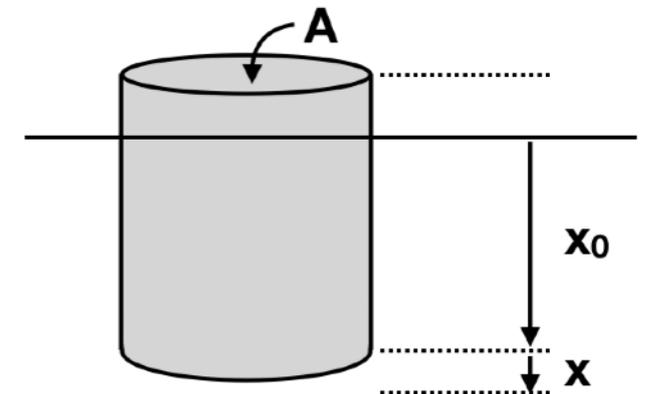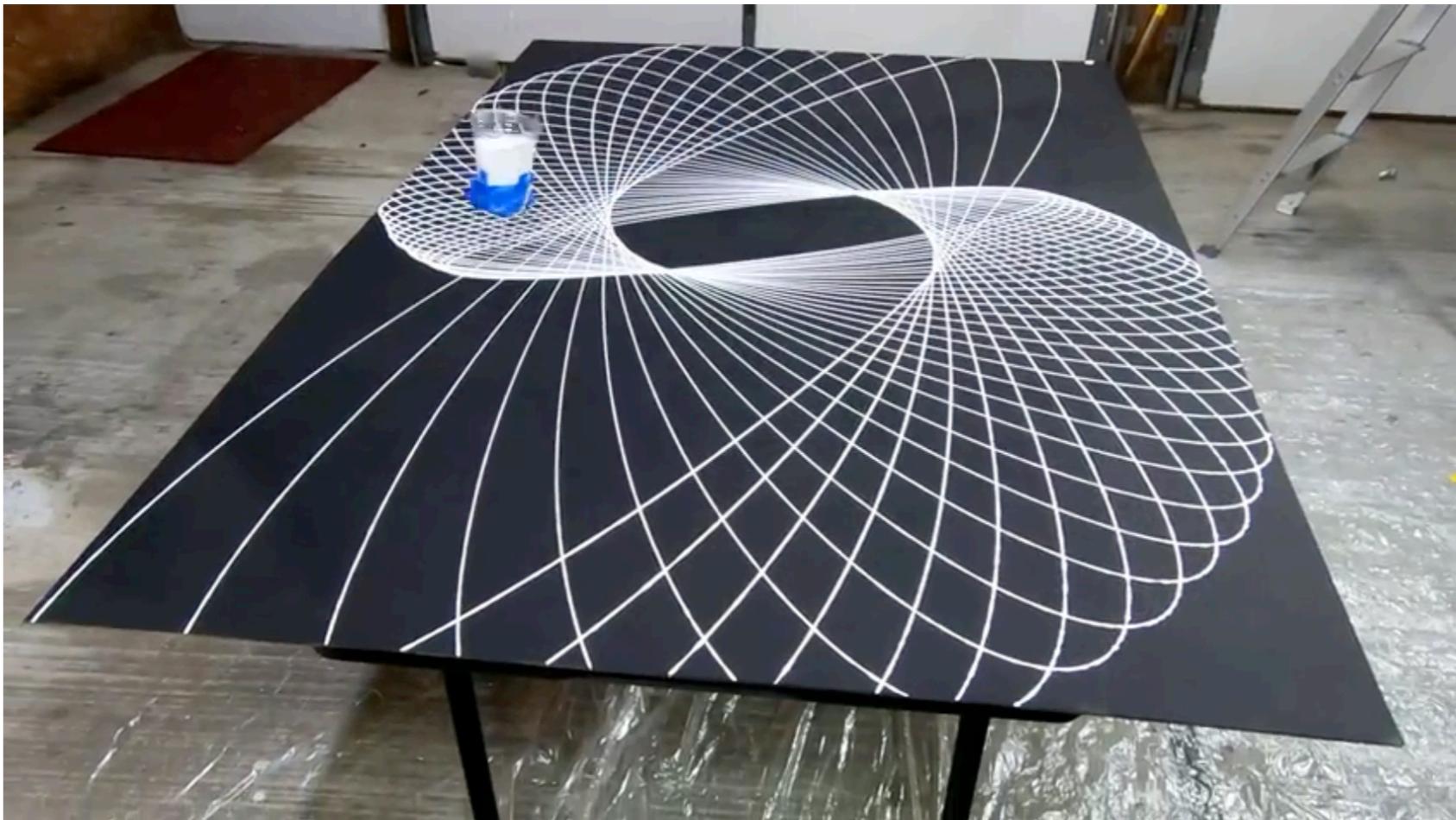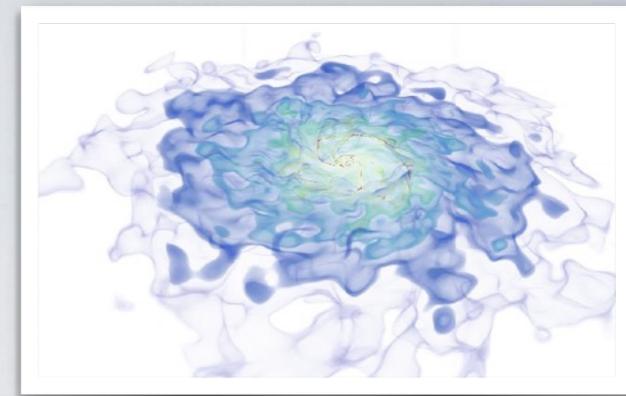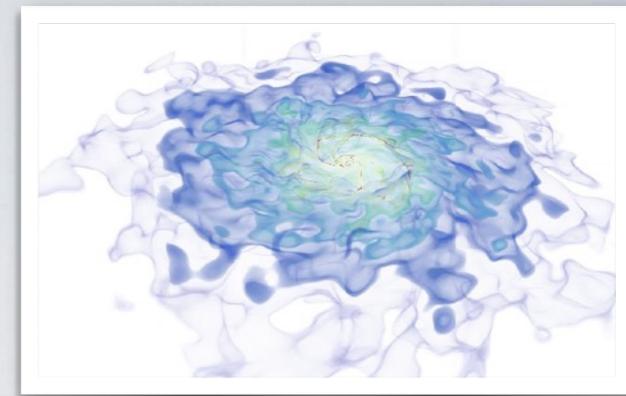
HW #1 will be posted!

(To be posted on jihoonkim.org, Due: Mar. 23 (Mon), 23:00pm,

Grader TA this time: 정은우, cewgenius@snu.ac.kr)

Stable Static Equilibrium: Cube On A Cylinder

Stable (and Unstable) Static Equilibrium

● A body returns to a state of static equilibrium after being slightly displaced from that state by a small force: stable static equilibrium.
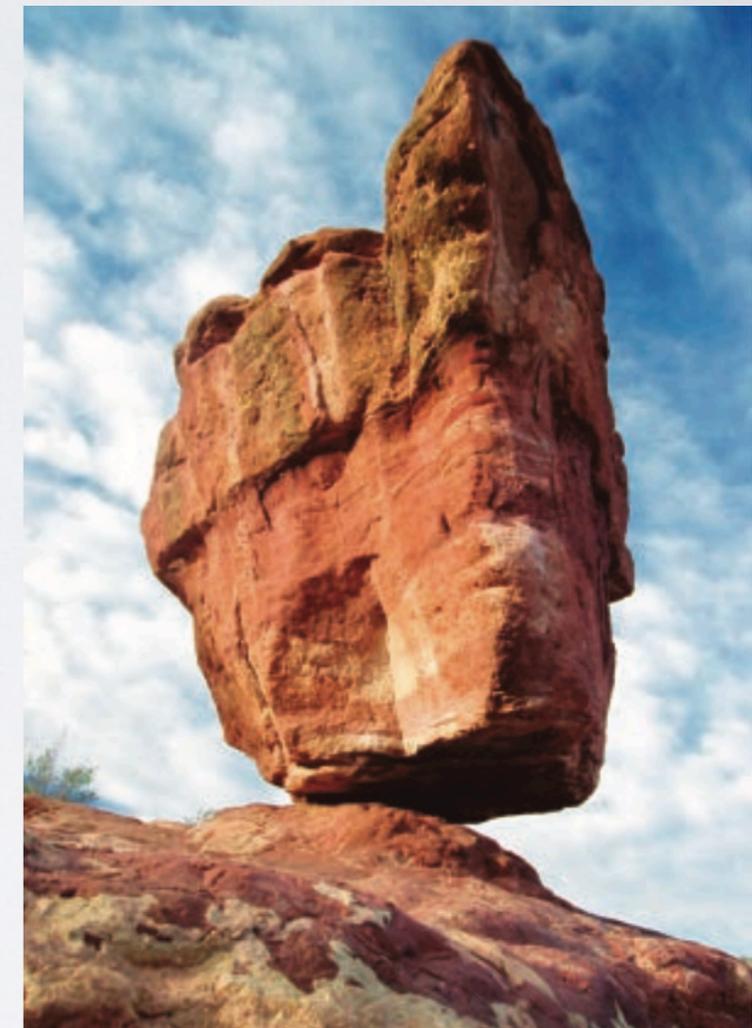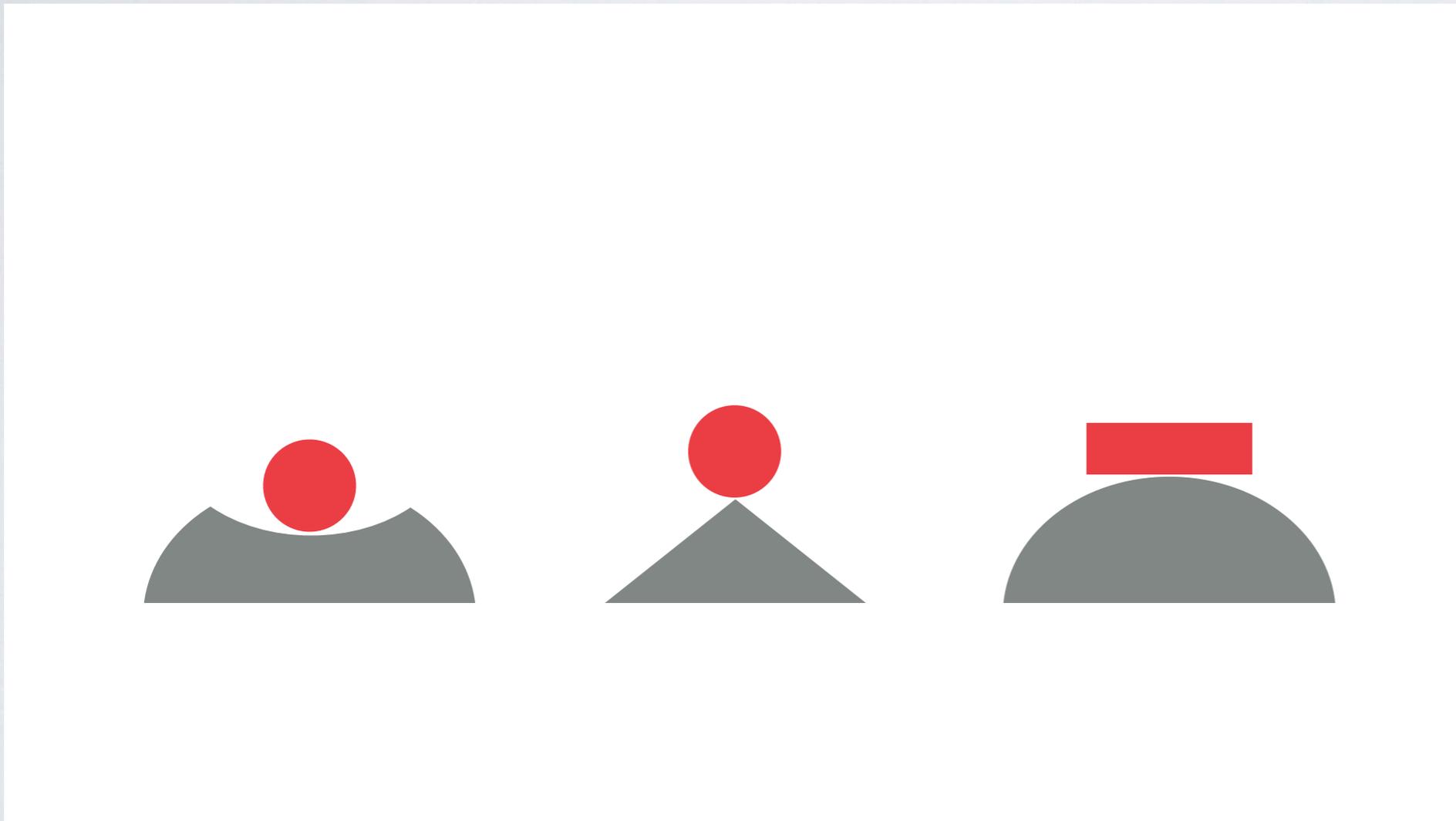
Figure 12-1, Halliday & Resnick

Stable Static Equilibrium: Potential Well

x*sinx + 1.05*cosx

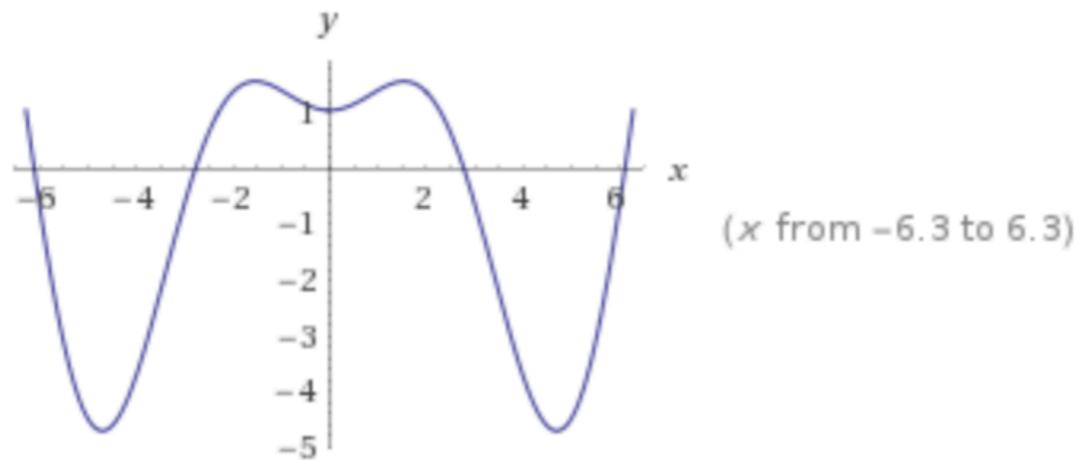Browse Examples   Surprise Me

Input:

$$x \sin(x) + 1.05 \cos(x)$$

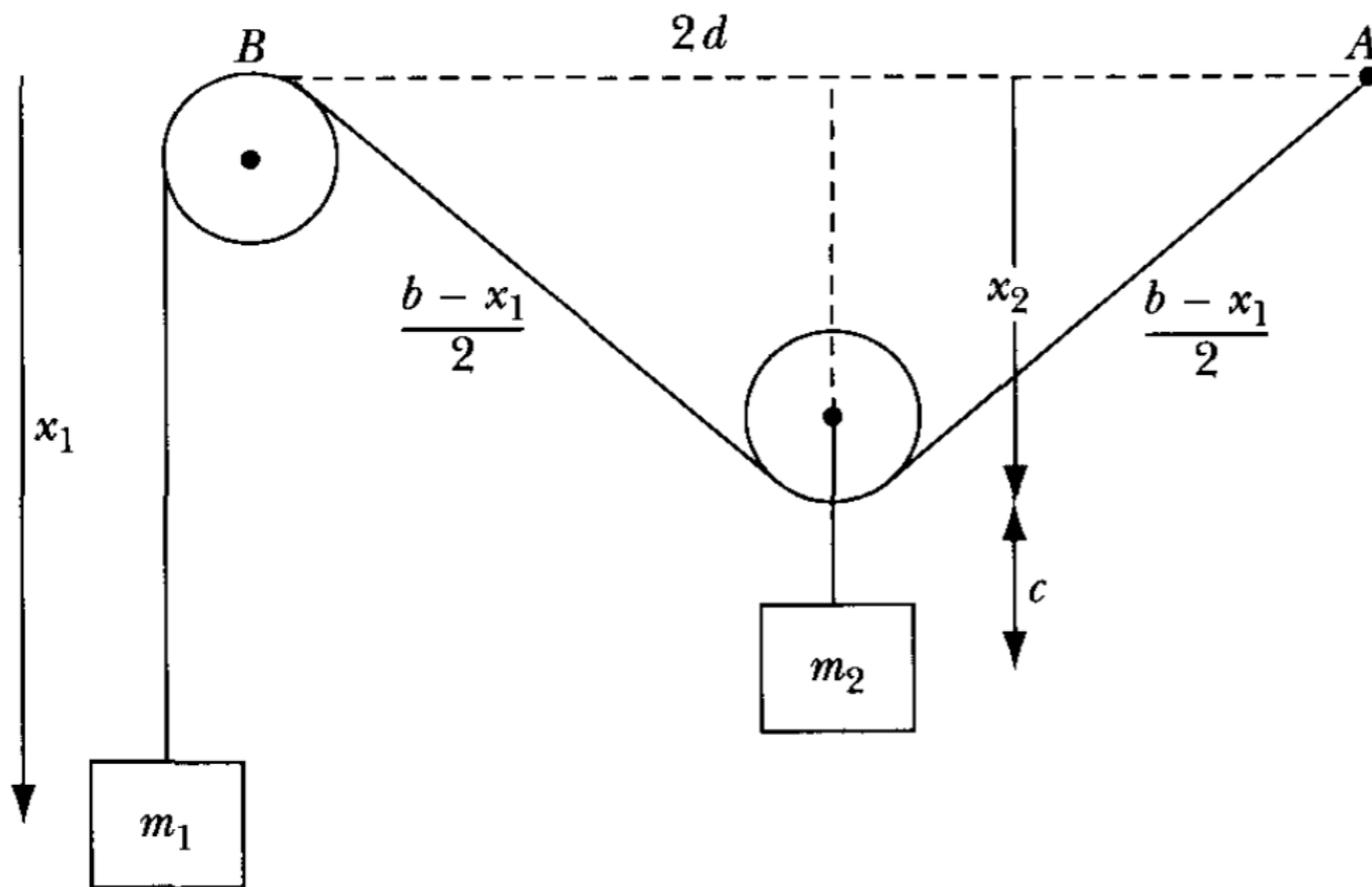Plots:

(x from -6.3 to 6.3)
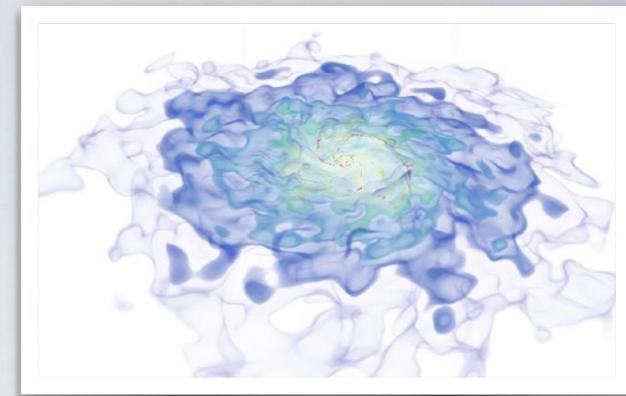
Stable Static Equilibrium: Two Pulleys and Two Masses

Stable (and Unstable) Static Equilibrium

- A body returns to a state of static equilibrium after being slightly displaced from that state by a small force: **stable static equilibrium.**
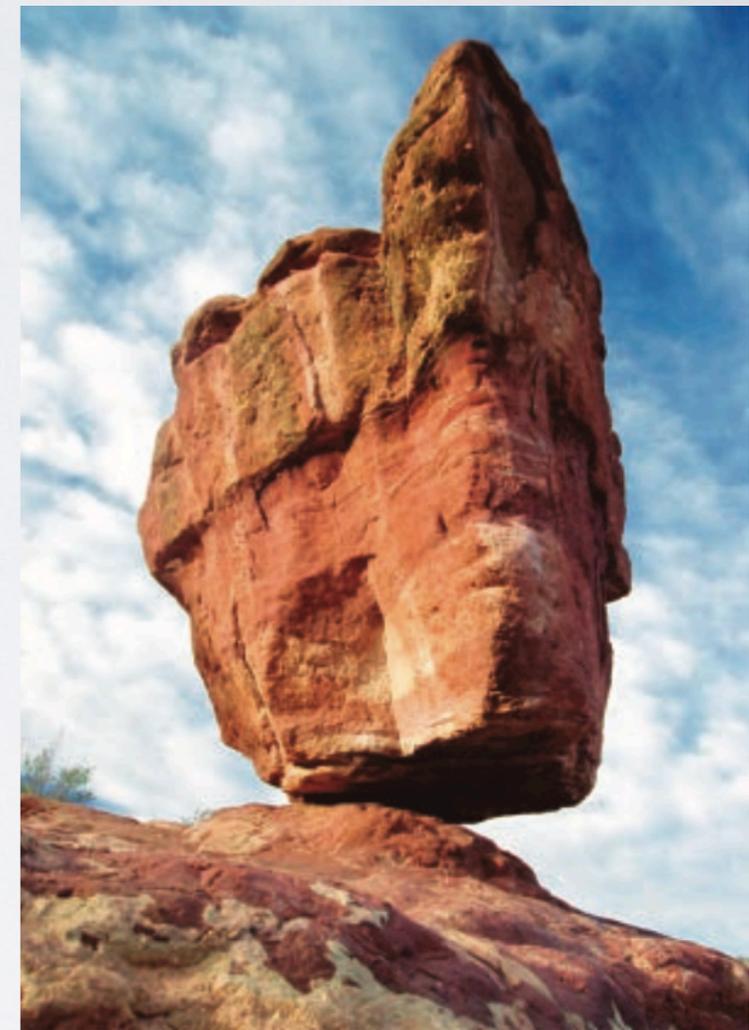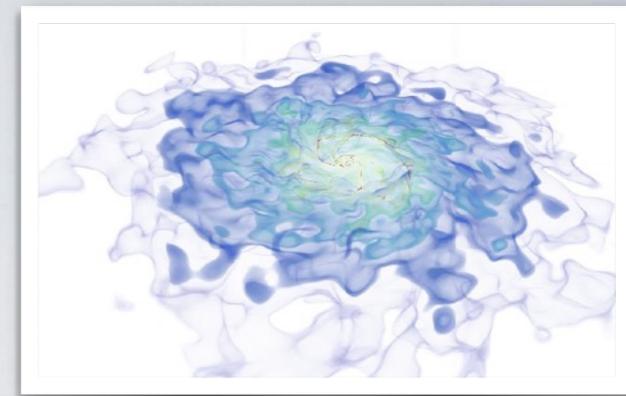

Thornton & Marion

Figure 12-1, Halliday & Resnick

Damped Simple Harmonic Motion: Hydraulic Door Closer

Damped Harmonic Oscillator

● The mechanical energy decreases during the oscillations because a drag force transfers mechanical energy to thermal energy.
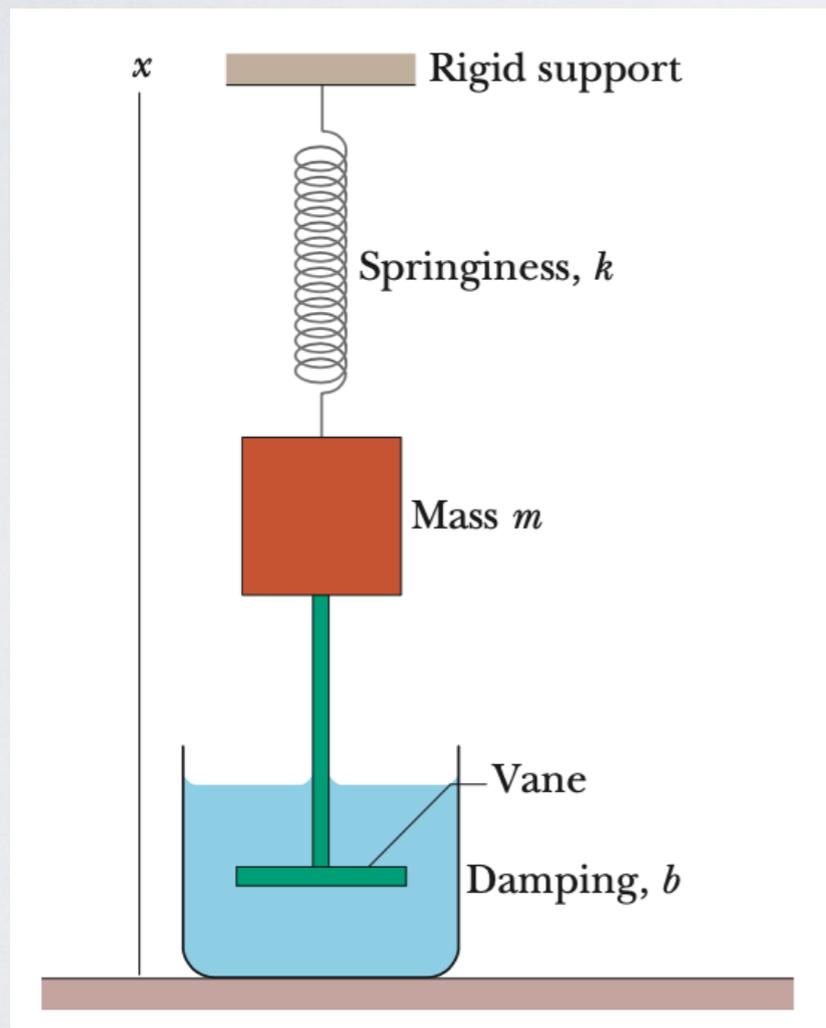

Figure 15-16, Halliday & Resnick

$$m\frac{d^2x}{dt^2} + b\frac{dx}{dt} + kx = 0$$

$$x(t) = x_m\, e^{-bt/2m} \cos(\omega' t + \phi), \quad \omega' = \sqrt{\frac{k}{m} - \frac{b^2}{4m^2}}.$$
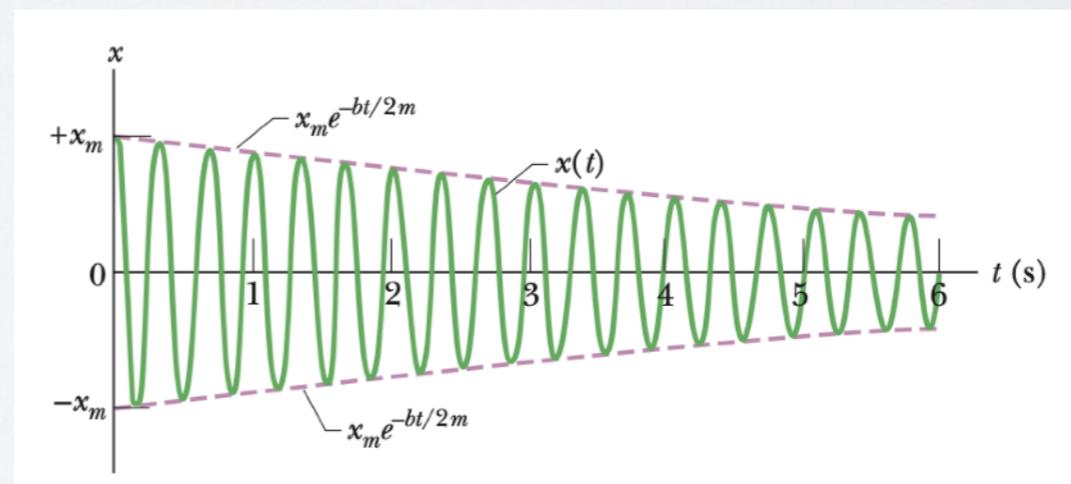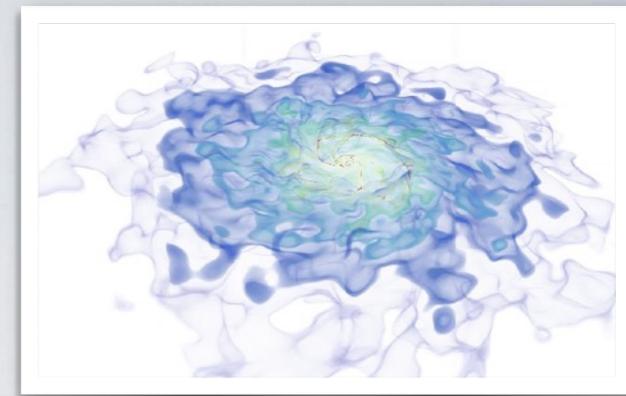
Eq.(15-41/42/43), Halliday & Resnick

Figure 15-17, Halliday & Resnick

Hydraulic Door Closer

- Friction adjusted to induce critically damped oscillations

www.youtube.com/watch?v=aoXstF7fjms

Phase Diagram

Phase Diagram