Announcements L11

- http://www.as.utexas.edu/~sj/a301-sp05.html

- Selected notes from lectures 8+9+10 online

- Homework assignment due Monday by noon
  No late HW accepted.

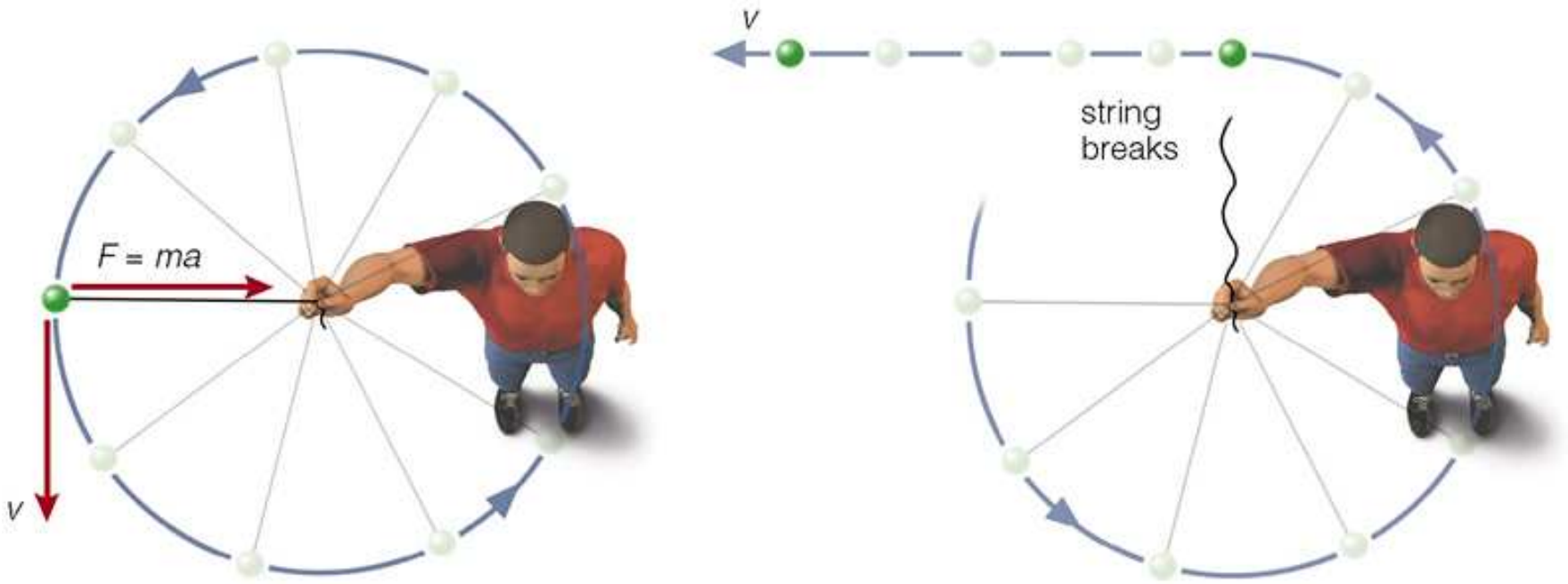
- Help available during office hours
  Nick Sterling out of town. Contact Nairn Baliber or myself

Some topics to be covered….

See class notes

- Centripetal force.
- Orbiting in free fall around the Earth
- Lunar tides
- Work, Energy, Power.
- Forms of Energy. Mass-Energy equivalence.
- The Nature of Light

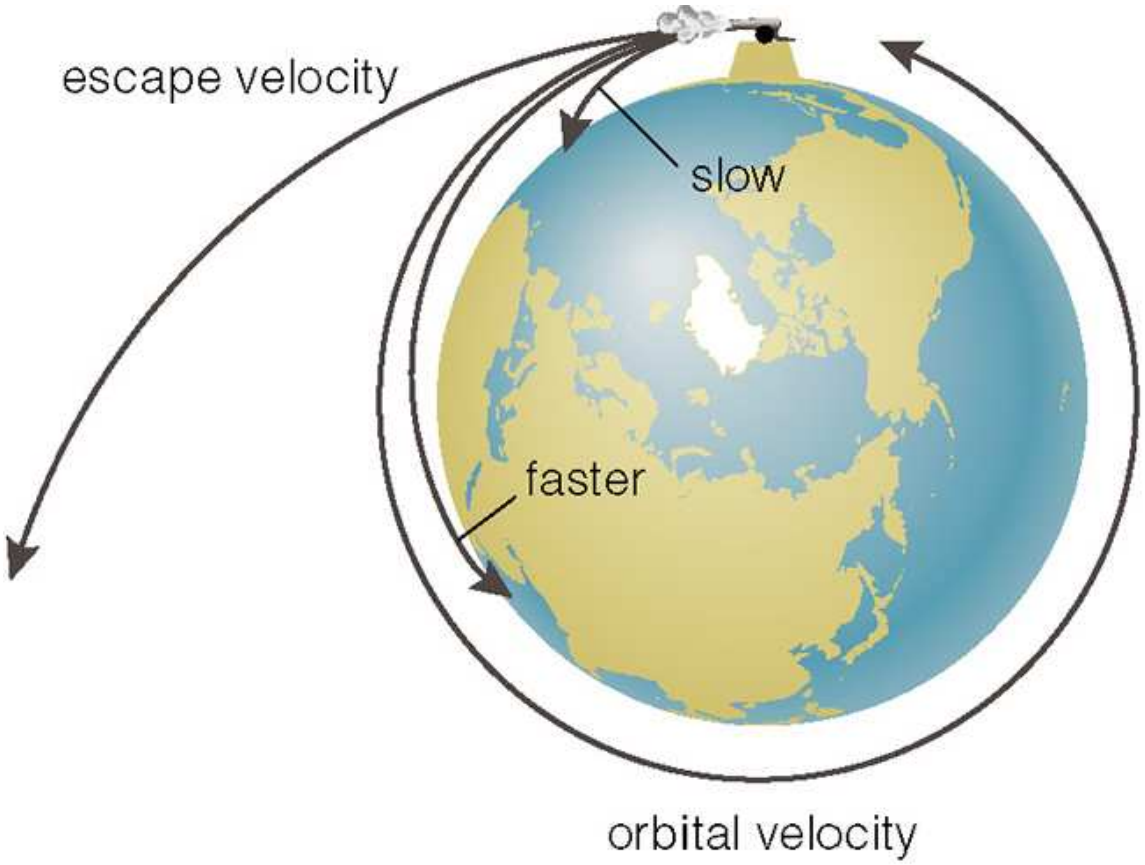
Centripetal Force



Centripetal force ***F*** = force needed to keep object of mass M orbiting in a circle of radius R at speed v

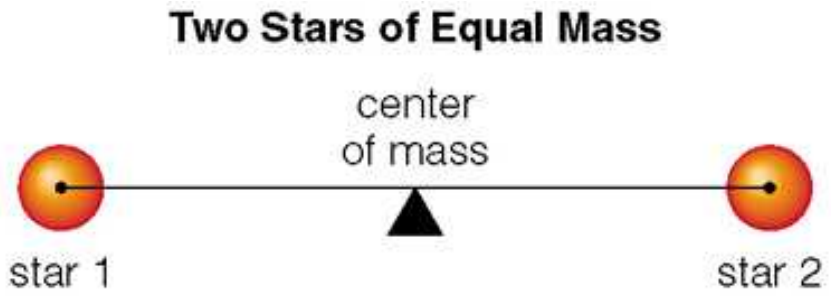
Magnitude of centripetal force = M a = M v^2 /R

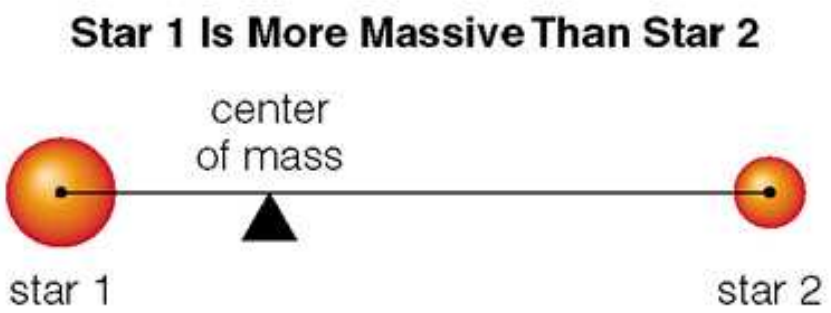
Orbiting in Free Fall around Earth vs Escaping

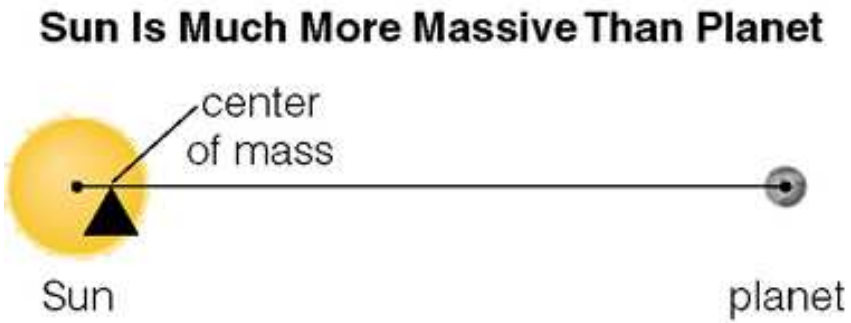


In-class : Canonball movie

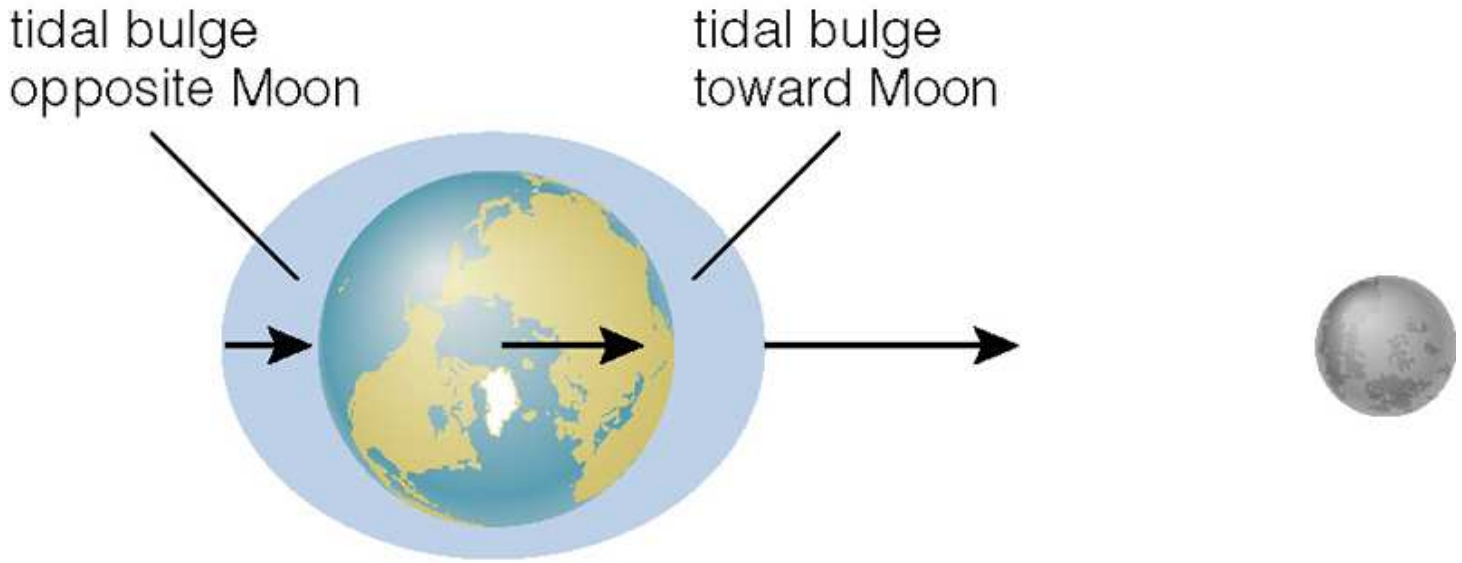
Center of Mass of 2 (orbiting) Bodies







Tides: Motion of Earth & Centripetal vs Gravitational forces

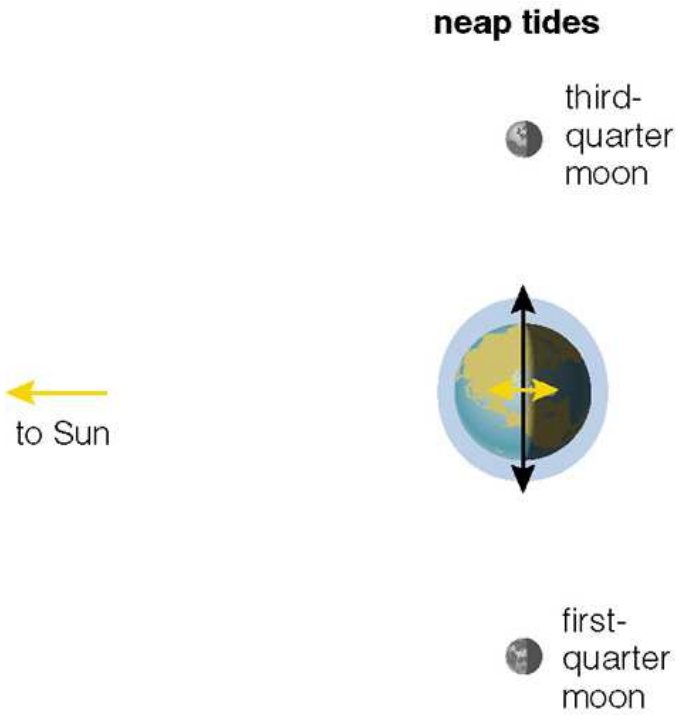


Not to scale! The real tidal bulge raises the oceans by only about 2 meters.

Why do we get tidal bulges of about same magnitude on both sides of Earth?

Why do we get 'high' tides twice a day?

Spring and Neap Tides



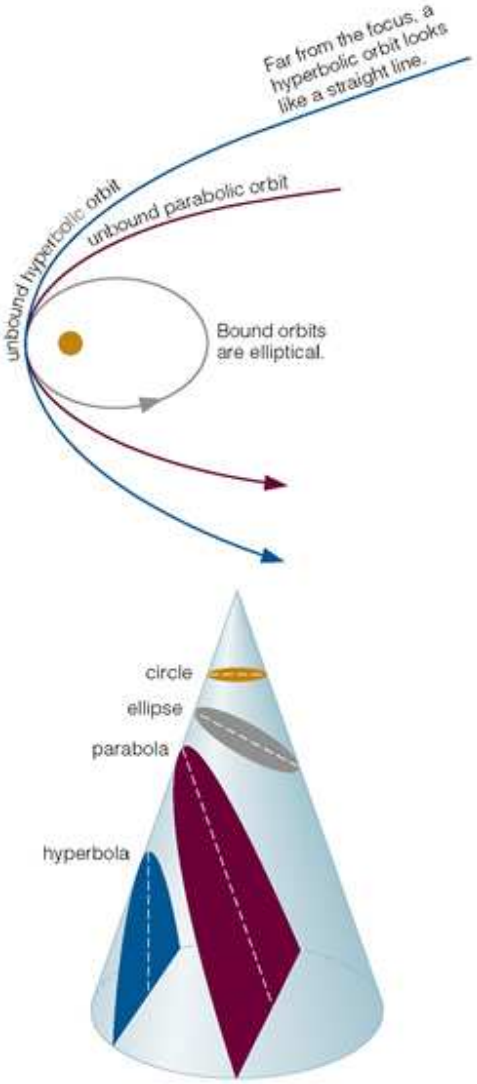
- Spring tides:

At new and Full moon, tidal forces from Moon and Sun reinforce each other leading to enhanced tides

- Neap tides

Force from Sun perpendicular to Moon's force on E\

Newton's laws of gravity : Explain + Generalise Kepler's laws



- Orbital paths allowed by law of gravity
  ellipses, hyperpolas, parabolas

- Ellipses = only orbits that are bound

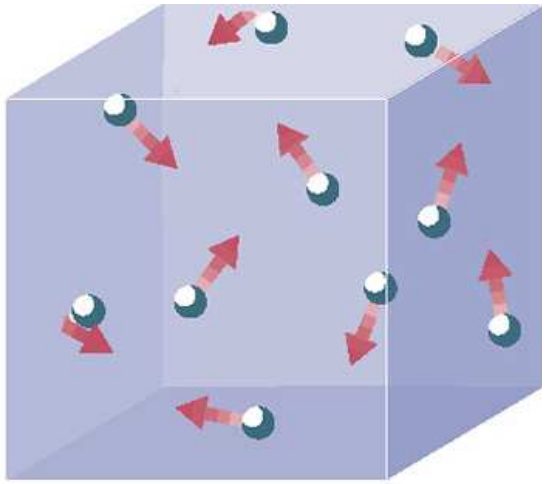
Work and Different forms of Energy

Energy and Work

Table 4.1 Energy Comparisons

Item	*Energy (joules)*
Average daytime solar energy striking Earth, per m^2 per second	1.3×10^3
Energy released by metabolism of one average candy bar	1×10^6
Energy needed for 1 hour of walking (adult)	1×10^6
Kinetic energy of average car traveling at 60 mi/hr	1×10^6
Daily energy needs of average adult	1×10^7
Energy released by burning 1 liter of oil	1.2×10^7
Energy released by fission of 1 kg of uranium-235	5.6×10^{13}
Energy released by fusion of hydrogen in 1 liter of water	7×10^{13}
Energy released by 1-megaton H-bomb	5×10^{15}
Energy released by major earthquake (magnitude 8.0)	2.5×10^{16}
Annual U.S. energy consumption	10^{20}
Annual energy generation of Sun	10^{34}
Energy released by supernova (explosion of a star)	10^{44}–10^{46}

Forms of Energy



Kinetic energy

Thermal Energy

Radiative energy (light)

Gravitational potential energy

Sound energy