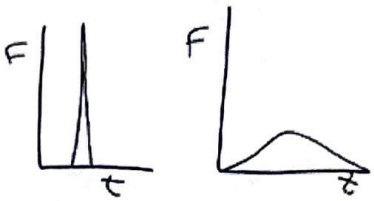
Final Exam: Review (Day 3)

How is the Impulse represented on a Force vs. Time graph?

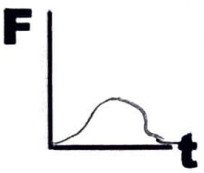
The area under the Force vs time graph

If a car crashes into a wall, what will happen to the force of the car if the time of impact is doubled?

The force will be halved

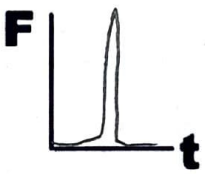


For each pair of situations, sketch out which Force vs. Time graph it would have.

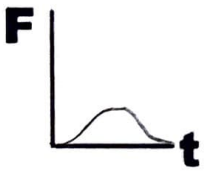


I caught a fastball with a glove.

Vs.

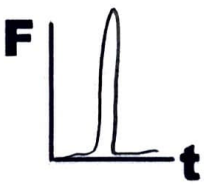


I caught a fastball without a glove.

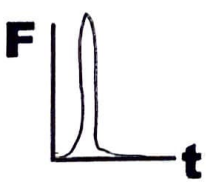


I landed on a trampoline.

Vs.

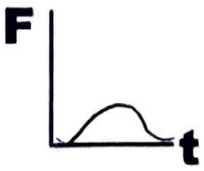


I landed on concrete.



Getting hit in the face with a basketball.

Vs.



Getting hit in the face with a water balloon.

Final Exam: Review (Day 3)

Kepler's Laws are sometimes referred to as "Kepler's Laws of Planetary Motion" Why is this an inaccurate, or incomplete, name for these laws? What would be a better name for them?

Kepler's Laws don't describe the orbit of planets, they describe the orbits of every celestial body!

What number can eccentricity range from? What does eccentricity determine?

Eccentricity can range from 0 to 1.

Eccentricity determines how elliptical (oval-shaped) an orbit is.

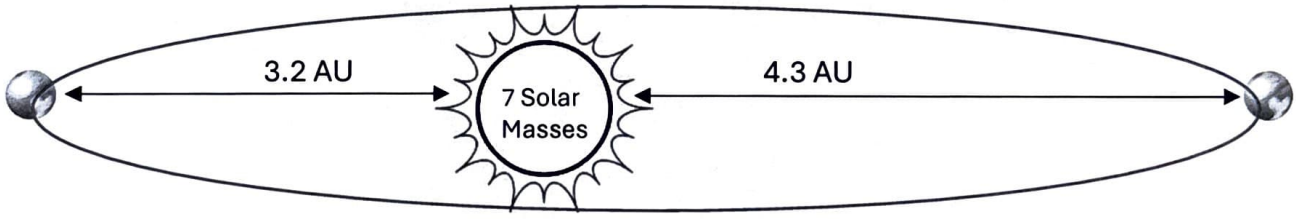
Kepler's Third Law relates semimajor axis, orbital period, and mass. What is the equation that relates these three variables?

$\frac{a^3}{T^2}$ = mass of object being orbited in Solar Masses

a - semimajor axis in AU

T - orbital Period in Earth years

Fill in the table below based on the illustration. Include the right units (Image not to scale)



Aphelion:	4.3 AU
Perihelion:	3.2 AU
Major Axis:	4.3 AU + 3.2 AU = 7.5 AU
Semimajor Axis:	$\frac{7.5\ AU}{2}$ = 3.75 AU
Eccentricity:	$\frac{4.3-3.2}{4.3+3.2} = \frac{1.1}{7.5}$ = 0.147
Orbital Period:	$\frac{(3.75)^3}{T^2} = 7$ T = 0.36 Earth years

Around 133 days!

Final Exam: Review (Day 3)

Rank the planets orbits from MOST elliptical to LEAST elliptical!

- Rossem: Aphelion = 4.8 AU; Perihelion = 4.5 AU
- Trantor: Aphelion = 1.5 AU; Perihelion = 1.4 AU
- Ix: Aphelion = 2.2 AU; Perihelion = 1.9 AU
- Vormir: Aphelion = 8.5 AU; Perihelion = 8.1 AU

Most Elliptical → Least Elliptical

IX Trantor Rossem Vormir

Rossem: $\frac{4.8-4.5}{4.8+4.5} = 0.032$

Trantor: $\frac{1.5-1.4}{1.5+1.4} = 0.034$

IX: $\frac{2.2-1.9}{2.2+1.9} = 0.073$

Vormir: $\frac{8.5-8.1}{8.5+8.1} = 0.024$

Planet	Semimajor Axis	Orbital Period
Marklar	4 AU	2 Earth Years
Naboo	2 AU	4 Earth Years
Salusa Secundus	5 AU	5 Earth Years
LV-426	10 AU	25 Earth Years
Terminus	8 AU	4 Earth Years

Star	Planet?
16 Solar Masses	Marklar
1.6 Solar Masses	LV-426
32 Solar Masses	Terminus
5 Solar Masses	S. S
0.5 Solar Masses	Naboo

Marklar: $\frac{4^3}{2^2} = \frac{64}{4} = 16$

Naboo: $\frac{2^3}{4^2} = \frac{8}{16} = 0.5$

Salusa Secundus: $\frac{5^3}{5^2} = \frac{125}{25} = 5$

LV-426: $\frac{10^3}{25^2} = \frac{1000}{625} = 1.6$

Terminus: $\frac{8^3}{4^2} = \frac{512}{16} = 32$

Final Exam: Review (Day 3)

Modern Physics Vocabulary

What is the phenomenon where time ticks slower as the curvature of spacetime increase and time ticks at different rates for observers depending on their speed relative to each other?

Time Dilation

What lies at the center of a black hole and is the point at which all matter that enters the black hole will inevitable end up?

Singularity

What is the region around a black hole where light can orbit, albeit unstably, around the black hole?

Photon Sphere

The radius an object needs to be compressed into to form a black hole is called...

The Schwarzschild radius

What is the region in space where no light can escape due to the immense curvature of spacetime?

The Event Horizon

A disk of super-hot dust and gas swirling around the black hole at a significant fraction of the speed of light is called...

The Accretion disk

What is the phenomenon where light bends around a massive objects like galaxy clusters and black holes?

Gravitational lensing

... curves in the presence of mass and is how gravity is propagated throughout space.

spacetime

What is the phenomenon where the apparent length of distances and objects significantly shrink as they approach near the speed of light?

Length Contraction