Rotational Dynamics

Look the theme has circles which can rotate
now you are contractually bound to laugh

Questions?

If you have any, ask in the discord or google classroom

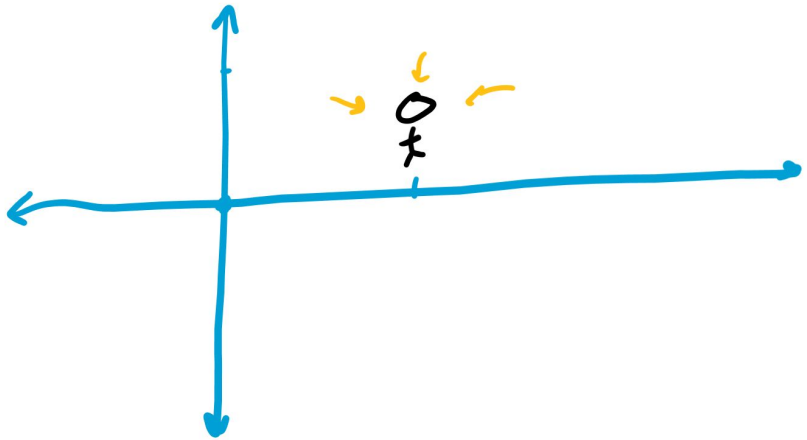
Link to classroom: Electricity and Magnetism (google.com)

Force

Position

Where you are

Measured in meters (m)

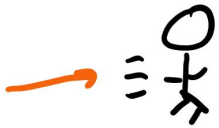


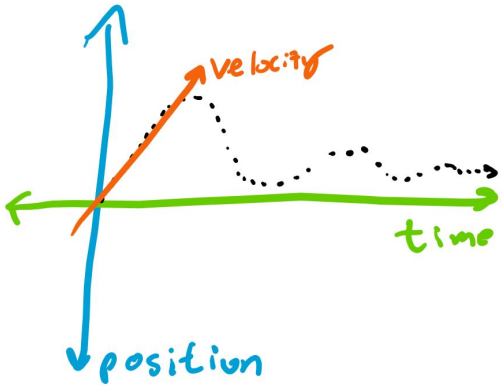
Velocity

How fast you're moving

Change in position over time

Measured in meters divided by seconds (m/s)



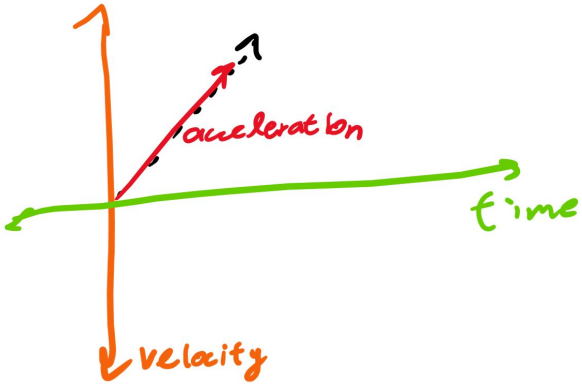


Acceleration

How fast your speed is changing

Change in velocity over time

Measured in meters per second per second (m/s/s = m/s^2)



Force

How much something “pushes” something else

Depends on how heavy something is

Depends on how much you accelerate it

Equation

If you accelerate something more (like punting vs tapping a ball) you exert more force

If you accelerate a heavier mass (bowling instead of ping pong ball) you exert more force

If mass or acceleration increase, force does too

Gravity

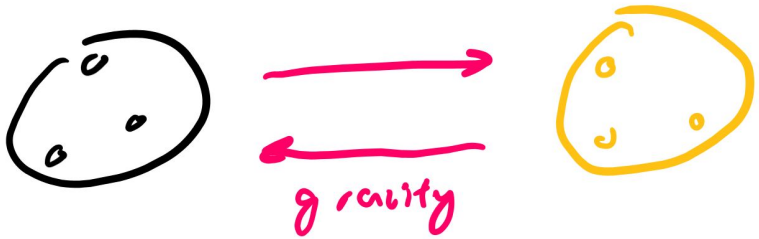
What is gravity?

A force things with mass exert

All things with mass exert an “attractive” force on other objects

More massive things exert more force

The closer objects are, the more they can attract each other



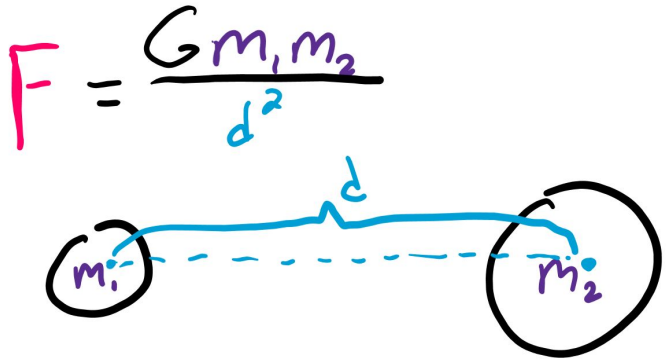
Newton's Law of Universal Gravitation

Let's say we have two objects

The more mass both objects have, the more "force" they exert on each other (mass in numerator)

The further they are away from each other, the less "force" they exert (distance in denominator)

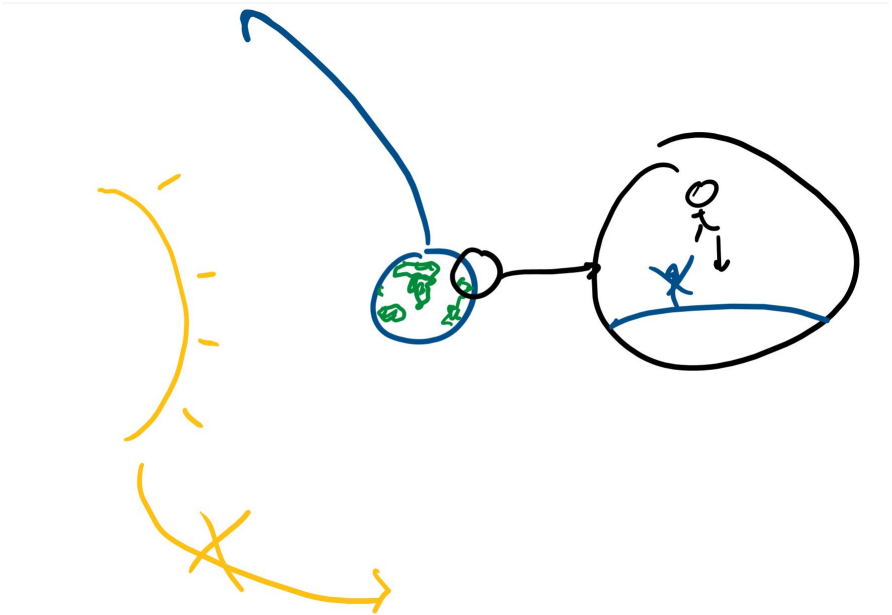
G (big G) is a constant used to make units work out



Weirdness

The gravitational force objects apply on each other are the same (I apply the same force on the earth as the earth does on me)

Why does the earth not move super quickly because of my gravity?



Small g

$$F = \frac{G m_1 m_2}{d^2} = m_2 g$$

On earth, the distance between me and the center of the earth, the mass of the earth, and big G won't change

Only thing that can change is my mass

Combine the "constants" to be a new constant, small g

That's the acceleration due to gravity!

Small g stands for gravitational acceleration

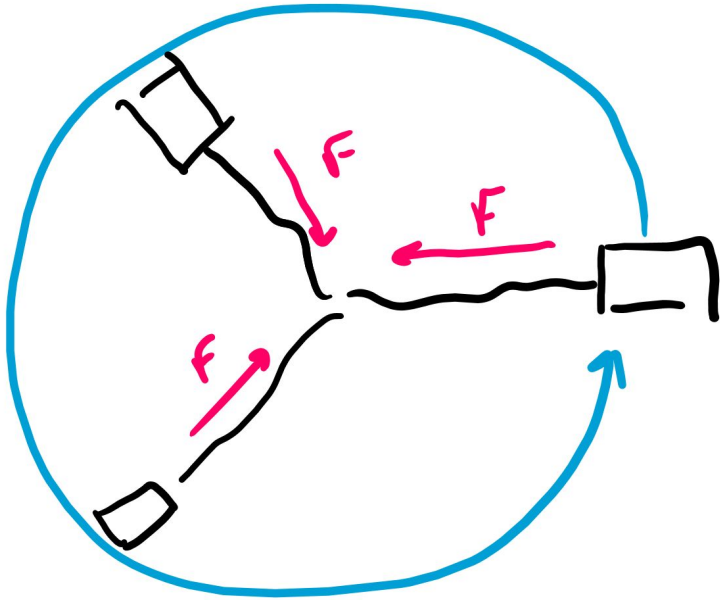
Torque

Planets orbit

When things move in a circular path, they are acted on by an inward force

If you swing a charging cable around, you pull the cable inward but the cable moves in a circle

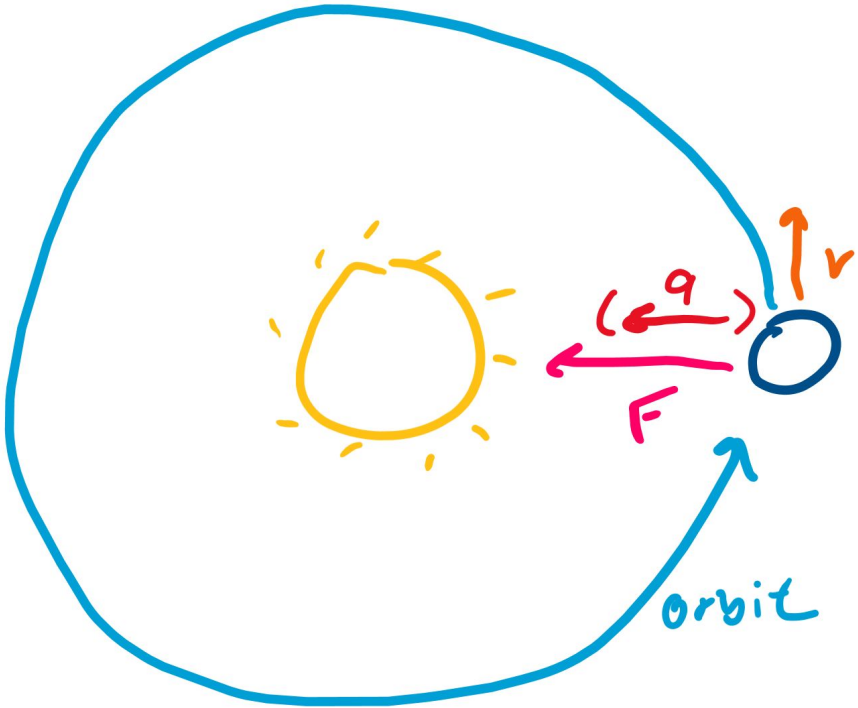
Gravity is the “inward force” planets have



Velocity

If a planet moves in a circle, its velocity is perpendicular to the acceleration

(If we zoom in on the orbit, the change in position is almost a straight line)

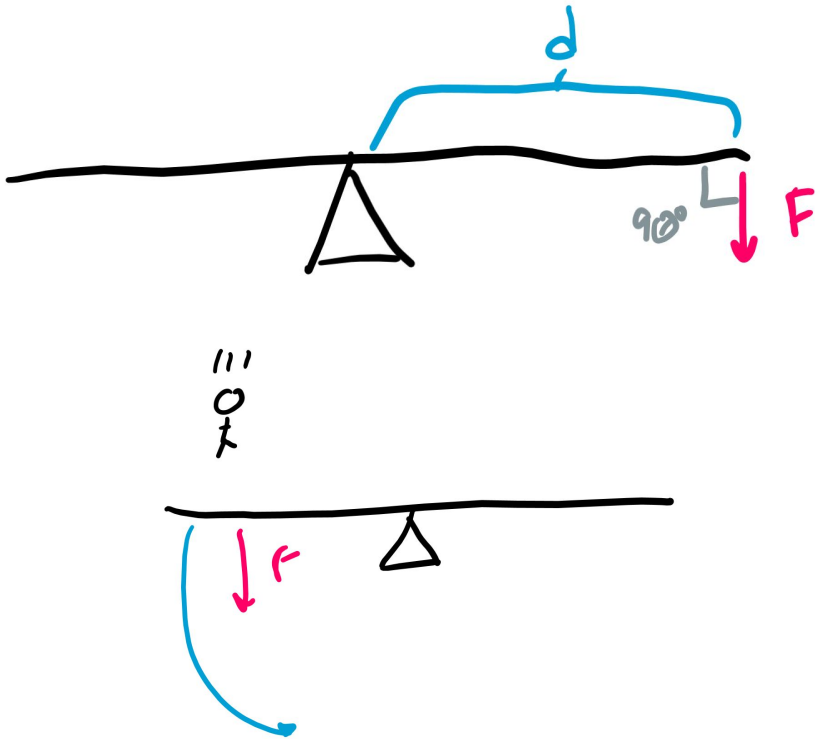


How to change velocity?

Torque!

This is when we apply a force perpendicular to some “pivot point”

When you jump on a see-saw, you apply a force perpendicular to the “arm” of the see-saw and cause it to rotate



Increasing velocity

If we speed up the spinning object, the orbit size gets bigger!