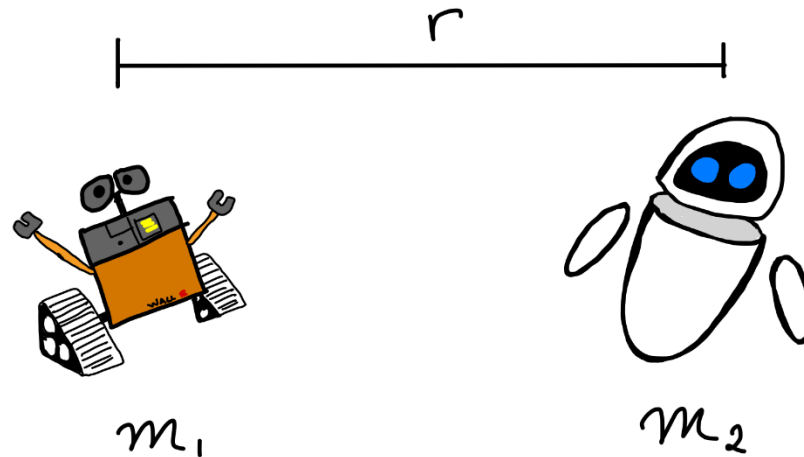# Universal Law of Gravitation

Any two objects with mass are going to feel a gravitational attraction to each other. The force that they will feel is given by Newton's Universal Law of Gravitation.

$$F_G = G \, \frac{m_1 m_2}{r^2}$$

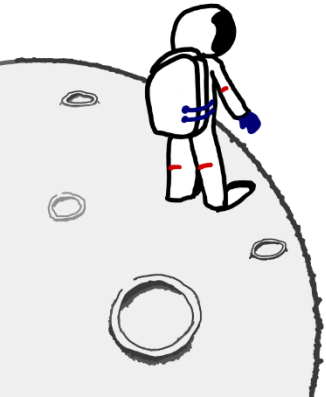$$G = 6.67 \times 10^{-11} \text{N} \, \frac{\text{m}^2}{\text{kg}^2}$$

Homework

Problem 1. Let's find the gravitational force we feel as we get close to a black hole with a mass similar to that of our sun:

$$M = 2 \times 10^{30} \text{ kg}$$

Use Newton's universal law of gravitation to find the gravitational force felt by an astronaut of mass m=100kg (including space suit), at the distances shown in the table below.

Distance [m]	Force [N]
1×10^{10}	
2.5×10^{10}	
5×10^{10}	
7.5×10^{10}	
1×10^{11}	

SN