

HW1

Reading assignment: Einstein chapters 1-6.

Reading assignment: Road to Reality chapter 1 handout.

For the problems below, please show all work!

1. Newton's law of gravitation is given by the equation below, where F is the gravitational force, M and m are masses, and r is the length. Force has units of $kg \times \frac{m}{s^2}$. What are the units for the constant G ?

$$F = G \frac{Mm}{r^2}$$

2. The speed of light is about $3 \times 10^8 m/s$. (a) Convert this to miles per hour. (b) If the sun is about 93×10^6 miles from Earth, provide an order of magnitude estimate for how long it takes the sun's light to reach Earth.
3. Estimate the number of ping-pong balls that would fit (without crushing them) into a typical-size room. In your solution, state the quantities you estimate and the values you use for them.
4. In a polar coordinate system a bug is located at $r = 4.5m$ and $\theta = 30$ degrees. Find the x and y coordinates of the bug assuming that the two coordinate systems have the same origin. Draw each coordinate system and the location of the bug.