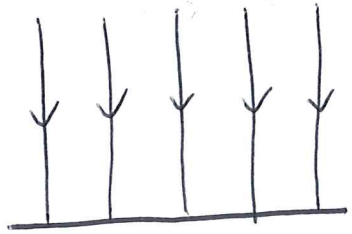
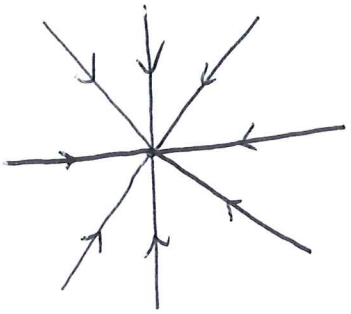
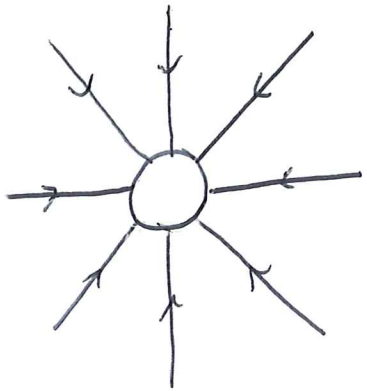
6.2 Gravitation

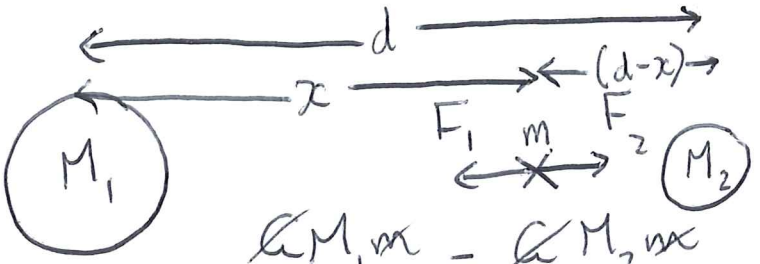


uniform
$W = mg$ ← constant



radial





$$\frac{GM_1m}{x^2} = \frac{GM_2m}{(d-x)^2}$$

(↘) $F_a = \frac{mv^2}{r}$

$$\frac{GMm}{r^2} = \frac{mv^2}{r}$$

$$\frac{GM}{r} = \left(\frac{2\pi r}{T}\right)^2$$

$$\frac{GM}{r} = \frac{4\pi^2 r^2}{T^2}$$

$$\frac{GM}{4\pi^2} = \frac{r^3}{T^2}$$

(Kepler's Third Law)

↳ GPS satellite navigation

Newton's Law of Gravitation:

Gravitational force of attraction between two bodies is proportional to the product of the bodies' masses and inversely proportional to their distance of separation squared.

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

(G ← universal gravitational constant)

Gravitational field strength = force acting per unit mass on a small point (test) mass

$$g = \frac{F_a}{m} = \frac{\frac{GMm}{r^2}}{m} = \frac{GM}{r^2}$$

(g ← gravitational field strength ($N\,kg^{-1}$); M ← mass creating field (kg); r ← distance (m))