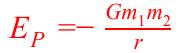
Potential at Infinity

We got used to calculating potential energy on Earth...

What about in space? How much sense does it make to calculate a height from Earth when you are approaching Betelgeuse?

That place to measure from is infinity (∞). E_P @ $\infty = 0$ J.

That energy will increase as the object approaches a mass.



NOTE: IS THE r SQUARED?

Calculate the E_P of a 5,000kg super pug at a distance of 3.0×10^7 m from the Earth's center.

We can also calculate the work done / required...

Work / Energy Theorem:

$$W = \Delta E = E_{pf} - E_{p0}$$

A mass of 5,000kg is moved from 2.0×10^7 m distance to 3.0×10^7 m distance (from the center of Earth). Find the work done.

A 10kg pug on the surface of the Earth has 4.0×10^8 J of work done on it, to what maximum height will it rise?

The Law of Conservation of Energy still applies. *remember from physics 11^*

$$E_{p0} + E_{k0} = E_{pf} + E_{kf} + Q$$

We can disregard Q in space.

Typical situations where we can use this formula:

- a) An object moving in space crashing into Earth (any planet)
- b) An object moving in space to some closer distance to Earth
- c) An object on the Earth moving into space

A comet of mass 1.0×10^7 hg is 4.0×10^9 m from Earth's center. It is moving at 2500 m/s and crashes into the Earth's surface. What is the impact speed?

$$\begin{split} E_{p0} + E_{k0} = E_{pf} + E_{kf} + Q \\ \text{Hint: } \mathbf{v_f} = & 11.4 \text{km/s} \end{split}$$

A pug is blasted off of the moon at 1.3km/s from the surface. To what height will it rise before coming to a rest? $m_{moon}=7.35 \times 10^{22} \text{kg}$ $r_{moon}=2.48 \text{Mm}$

Hint: height=750km

Escape Velocity: is defined as the velocity at a planet's surface necessary To ESCAPE to infinity, you can stop when you reach infinity. Escape Velocity Is found using Conservation of Energy.

Orbital relationship between E_p and E_k .