P12 - 7.0 - Gravitation and Circles Review

$\theta = \#REV \times 2\pi$

$W = Fd$

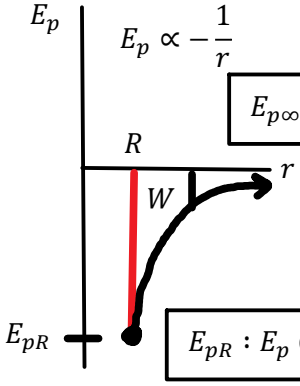
$W^* = \frac{GMm}{r^2} \times d$

$W^* = \frac{GMm}{r}$

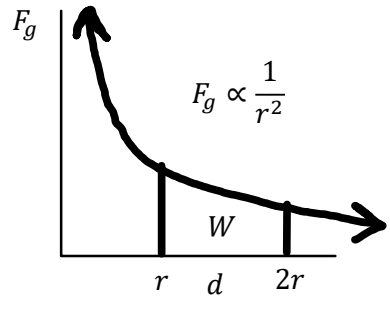
$F_g = \frac{GMm}{r^2}$

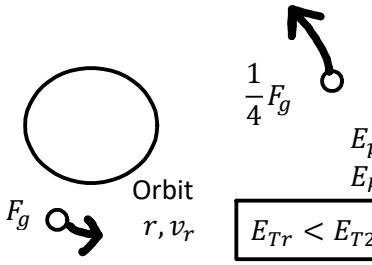
Calculus 12 BC

$E_p = -\frac{GMm}{r}$



$E_{pR} : E_p \text{ @ } R$





E_p: *See Left & Bottom Right*

If :
- -Double radius
- -Quarter Force of Gravity
- -Half potential
- -Half kinetic energy
- -Half total Energy
- -Increase in Energy
- -Decreases $v_{2r} = \frac{v_r}{\sqrt{2}}$

See Below!

$E_{p2r} = \frac{1}{2}E_{pr}$

$\frac{GMm}{2r} = \frac{1}{2}\left(\frac{GMm}{r}\right)$

$E_{k2r} = \frac{1}{2}E_{kr}$

$\frac{1}{2}mv_{2r}^2 = \frac{1}{2}\left(\frac{1}{2}mv_r^2\right)$

$v_{2r}^2 = \frac{v_r^2}{2}$

$v_{2r} = \frac{v_r}{\sqrt{2}}$

Orbit

$F_g = F_c$

$F_c = F_@ \ ; \ Orbit$

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

$\frac{GMm}{r^2} = m\frac{v^2}{r}$

$\frac{GM}{r} = v^2$

Calculus

$a_c = \frac{v^2}{r}$

$v = \sqrt{\frac{GM}{r}}$

$g = \frac{GM}{r^2}$

$v_{orbit} = \sqrt{g^* r}$

Orbit

$E_k = \frac{1}{2}mv^2$

$E_k = \frac{1}{2}m\left(\sqrt{\frac{GM}{r}}\right)^2$

$E_k = \frac{1}{2}m\frac{GM}{r}$

$E_k = \frac{1}{2}|E_p|$

$E_p = -\frac{GMm}{r}$

$E_T = E_k + E_p$

$E_T = \frac{1}{2}|E_p| + E_p$

$E_T = \frac{1}{2}E_p$

$\Delta E_{Orbit} = \frac{1}{2}|\Delta E_p|$

Escape Velocity

$\Delta E_p = -\Delta E_k$

$E_{pf} - E_{pi} = -(E_{kf} - E_{ki})$

$-E_{pi} = E_{ki}$

$-\left(-\frac{GMm}{r}\right) = \frac{1}{2}mv^2$

; $E_{pf} = 0$, $E_{kf} = 0$

$\frac{GMm}{r} = \frac{1}{2}mv^2$

$v_{escape} = \sqrt{\frac{2GM}{r}}$

$v_{swing(bot)} = \sqrt{2gh}$

$v_{\max circle} = \sqrt{\mu gr}$

$h_{min} = \frac{5}{2}r_{loop}$