Formulas

Given	Derived Formulas (to know)
$v=(2\pi r)/T$	$F_c=(mv^2)/2=(4\pi^2rm)/T^2$
$a_c=(v^2)/r$	$T_{orb}=(2\pi r^{3/2})/\sqrt{(GM)}$
$F_G=(GMm)/r_2$	$E_{total}=-GMm/2r$
$E_p=-(GMm)/r$	$g=(GM)/r^2$
$\Delta E_p=GMm(1/r_f-1/r_i)$	
$v_{esc}=\sqrt{(2GM/r)}$	
$v_{orb}=\sqrt{(GM/r)}$	

Key Concepts

$F_{net}=F_c$ on any object undergoing uniform circular motion

Vertical Circular Motion: over a hill, object swung with a string, loopty loop, etc.

Top of swing: $v = \sqrt{(rg)}$ → min. speed to maintain

Bottom of swing: $F_T = (mv^2)/r + mg$ → max. tension in the string

Variable M → no motion object (i.e. Earth being orbited)

Variable m → with motion object (i.e. satellite orbiting Earth)

To Remember

F_N is present when an object is on the ground (i.e. car on a curve)

Interstellar space station is in **space** → **no gravity** in space → only force is F_N the apparent weight of something

i.e. ... F_G of person A **due** to person B → person A is being affected

i.e. ... at 15500m **above** the surface of Earth → $r = R_E + 15500m$

If no r_i mentioned → $r_i=\infty$

If any final or initial variables are mentioned → $\Sigma E_i = \Sigma E_f$

E_T of any orbiting object in a gravitational field is **always negative**

Geosynchronous: to move at the same speed as the Earth

By **goldennfluff** (goldennfluff)

cheatography.com/goldennfluff/

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