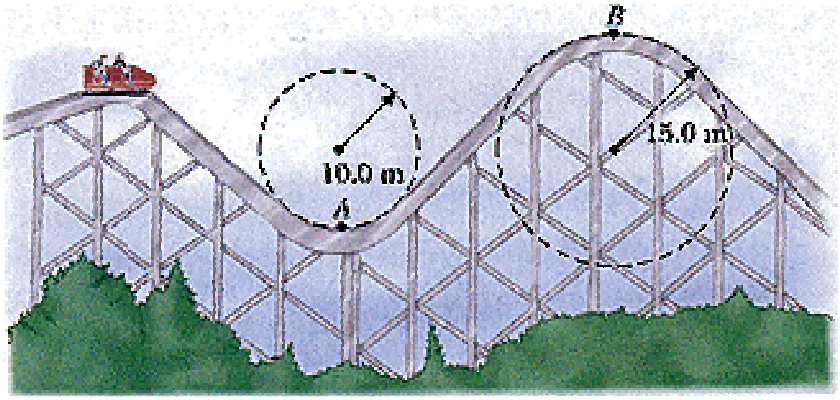
Energy with Circular Motion

May 10, 2017 8:21 AM



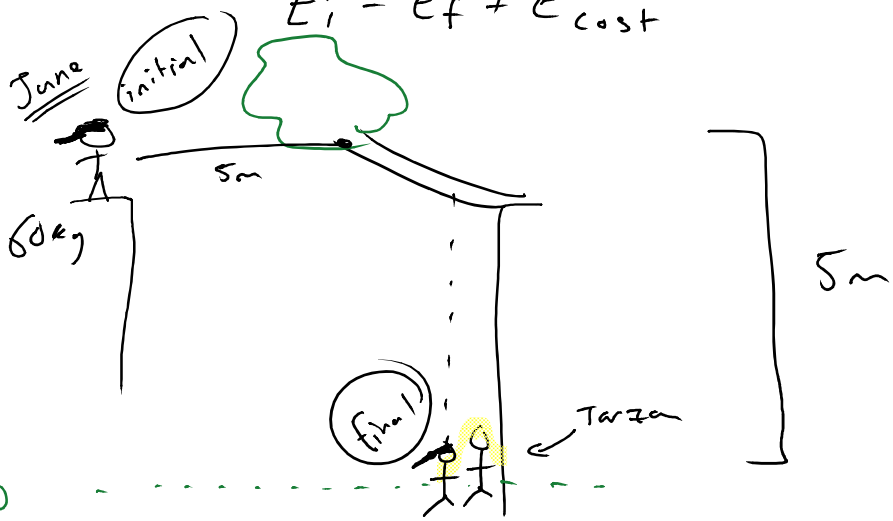
$PE = mgh$ $KE = \frac{1}{2}mv^2$

Conservation of Energy: Energy in a closed System is Conserved

$E_i = E_f$

* in an open System (one with Energy loss)

$E_i = E_f + E_{cost}$



The rope has a max tension of 12000N.

Q: will the rope break and what Velocity does Jane hit tarzan with

Energy

$E_i = PE_i + KE_i$

$= mgh + \frac{1}{2}mv^2$ ($v_i = 0$)

$E_f = PE_f + KE_f$ ($h = 0$)

$= \frac{1}{2}mv_f^2$

$= mgh + \frac{1}{2}mv^2$ $\quad v_i = 0$ $\quad = \frac{1}{2}mv_f^2$

$= (60)(9.8)(5) + \frac{1}{2}(60)(0)^2$ $\quad E_f = \frac{1}{2}(60)v_f^2$

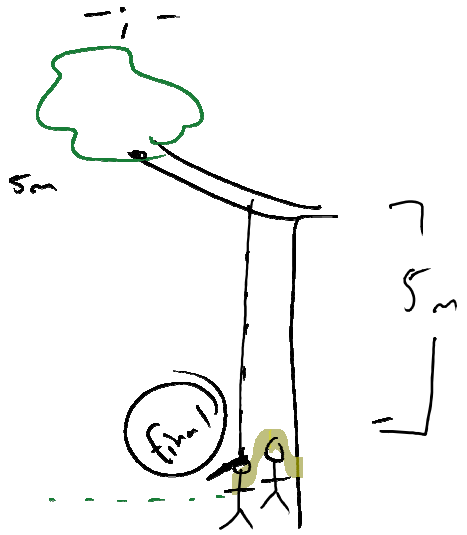
$E_i = 2940\,J$ $\quad E_f = 30v_f^2$

$$E_i = E_f$$

$$\sqrt{\frac{2940}{30}} = \sqrt{\frac{30v_f^2}{30}}$$

$$v_f = 9.9\,m/s$$

Force diagram



$T - F_g = ma_c$

$T - mg = \frac{mv^2}{r}$

$T = \frac{mv^2}{r} + mg$

$T = 60\left[\frac{9.9^2}{5} + 9.8\right]$

$T = 1764\,N$