Dr. Sasha

Please, solve this problem and also show the steps to solve it.

21.06.2015 – N20

It is the information about the task N19

1) - correctly solved problem.

2) - correctly solved problem.

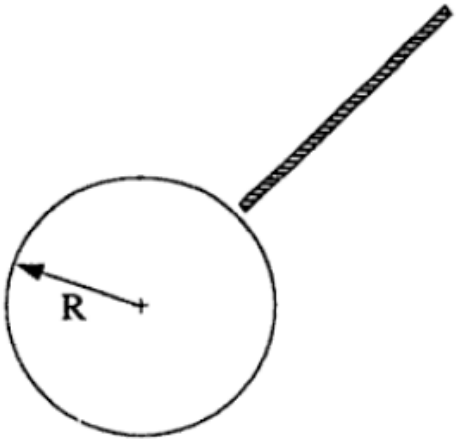
3) - need discussion.

4) I used you expression for speed of the spacecraft $v(t)=\frac{v_0}{\sqrt{1+\frac{2\rho\cdot v_0\cdot A\cdot t}{m_0}}}$. Then, the length $L[a,b]$ (total distance traveled between time a and time b) of the path $x(t)$ for $t\in(0,\infty)$ is

$$L=x(t)\Big|_{t=0}^{t=\infty}=\int_0^{\infty}v(t)dt=\frac{m_0}{\rho\cdot A}\sqrt{1+\frac{2\rho\cdot v_0\cdot A\cdot t}{m_0}}\Bigg|_{t=0}^{t=\infty}=\infty \qquad (1)$$

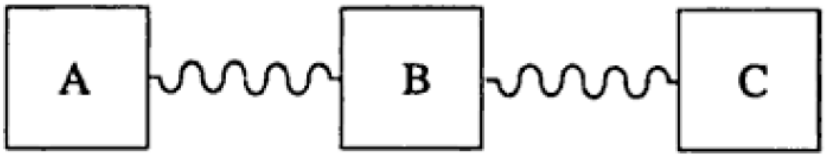
How it is possible, that the path length of the spacecraft is infinity? Do you think the spacecraft will not stop?

1) A “skyhook” is a satellite that consists of a long rope placed in orbit at the equator, aligned along a radius from the center of the earth, and moving so that the rope appears suspended in space above a fixed point on the equator (see figure below). The bottom of the rope hands free just above the surface of the earth (radius R). Assuming that the rope has uniform mass per unit length and that the rope is strong enough to resist breaking, find the length of the rope.



2) For the cycloid $x(t) = a \cdot t - a\sin(t),\ y(t) = a - a\cos(t)$ find the velocity and arc length of one arch.

3) Thee identical objects of mass m are connected by springs of constant k, as shown in figure below.



The motion is confined to one dimension. At $t = 0$, the masses are at rest at their equilibrium positions. Mass A is then subjected to an external driving force

$$F(t) = f \cdot \cos(\omega t), \text{ for } t > 0 \qquad (2)$$

Calculate the motion of mass C.