Q5: The 4 conditions are:

1. $\int_A^B \vec{F} d\vec{l}$ does not depend on trajectory.

2. $\oint_A^B \vec{F} d\vec{l} = 0$

3. $\vec{\nabla} \times \vec{F} = 0$

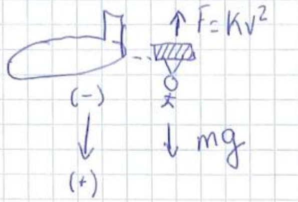
$$\left.\begin{matrix} \oint_A^B \vec{F} d\vec{l} = 0 \\ \vec{\nabla} \times \vec{F} = 0 \end{matrix}\right\} \quad \oint_A^B \vec{F} d\vec{l} = \iint (\vec{\nabla} \times \vec{F}) \, ds$$

4. $\exists$ an scalar function (U_p) (potential energy) such as $\vec{F} = -\nabla U_p$

~~The field is conservative~~

The most convenient method is checking if the total work done by the field on a particle that performs a displacement in a closed path is zero.

Q4. First we are going to write the diagram.



Newton's second law:

$\sum \vec{F} = m\vec{a}$

x axis: $mg - Kv^2 = ma$

$a = \frac{dv}{dt} \longrightarrow mg - Kv^2 = m\frac{dv}{dt}$ At this point:

$dt = \frac{m}{mg - Kv^2} dv$

In the case we want to integrate it:

$$\int_0^t dt = \int_{v=v_0=0}^{v} \frac{m}{mg-Kv^2} dv$$

Q3: The static friction coefficient.
Since there is no slippage, the contact point of the wheel has $v = 0$, this is the reason we take the static coefficient and not the dynamic.
Because the ~~coefficient~~ static coefficient is greater than the dynamic, the ABS function is to not completely block the wheels to keep the coefficient acting and reduce the stopping distance.

Q2: The potential energy ~~decreases~~ increases because it depends on the distance since in the formula;

$$\cancel{\Delta V_{A\to B} = -\frac{GM}{r_B} + \frac{GM}{r_A}}$$

$V = \frac{-GM}{R}$ the distance is in the denominator, the greater the distance the lower the energy.

The sistem doesn't tend to this state because masses always attract.

Q1: The force is stronger in A because, since the 2 points are on the same equipotential curve~~s~~, they have the same potential, so, by $F = -\text{grad}\, V$, as the gradient is greater in A, the force is grater in A