Hint 2

IMPORTANT! The next task is both a hint and an alternative to the main task. Three important points:

1. You can continue to send the solution to the main problem.

2. At any moment before the final deadline you can start to solve the Alternative problem. If you do so, at the beginning of the solution write: *I am doing the Alternative problem!* In this case a penalty coefficient for the Alternative problem is

$$0{,}7 \cdot \sum_i \frac{k_i \cdot p_i}{10},$$

where p_i is a point for the problem item, and k_i is a penalty coefficient for the corresponding problem's item at the moment of moving to the Alternative problem. In other words, maximal points for the alternative problem equals to the maximal points you can gain at the moment of moving to the alternative one multiplied by 0,7. Also, we remind you that a penalty coefficient can't be less than 0,1. Solutions of the main problems from that moment will not be checked. Be careful!

3. The task consists of several items. The penalty multiplier earned **before** is applied to all points. In the future, each item is evaluated as a separate task. If you send a solution without any item, this item's solution is considered as Incorrect. For more information about scoring points for composite tasks, see the rules of the Cup.

Alternative problem

Path of the Point. Linear case II

Follow the link to the alternative notebook. Review in the notebook the cell «Path of the Point». The following «function» is analyzed in the section: $\{\lambda x\}$ — the fractional part of λx, where $\lambda = \text{const} > 0$. In all parts of this section of the problem, we will only consider the values of $x \in [0, 1]$.

1. *(2.5 points)* Draw $f(x)$ for $\lambda = 2$.

2. *(2.5 points)* Qualitatively plot $f^2(x)$ and $f^4(x)$ for values of the parameter $\lambda = 2$, $\lambda = 2{,}5$, $\lambda = 4$.

3. *(2.5 points)* Find the dependence of the number of equilibrium positions on the degree of the function for $\lambda = 2$.

4. *(2.5 points)* Open the notebook cell in the section «Discrete model. Linear case». Change the «function» to the one that is being studied in the alternative problem. This section

shows all the values that are obtained after a large number of mappings with λ from 10 to 20. Try to analyze the result.