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Problem 6.1: The ice skater**[Oral | 2 pt(s)]**

ID: ex_ice_skater:km25

Learning objective

This task shows how constraints can influence conserved quantity. The aim of the task is not to carry out detailed calculations, but to classify which conservation laws are violated on the basis of the constraint condition and constraining force.

There is a tree in the center of a frozen lake. The skater Emmy is skating around this tree. A rope is stretched between the tree and Emmy, which slowly unravels as she skates around it. Two observers argue about what will happen if Emmy skates further laps around the tree without friction and without accelerating.

- (1) The first one says: »From conservation of angular momentum, it follows that Emmy gets faster and faster the more the rope winds up. «
- (2) The second says: »Conservation of energy applies and therefore Emmy always remains the same speed. «

- a) Which of the two observers is right? Justify your answer (an explicit calculation is not necessary). **1^{pt(s)}**
- b) Describe a similar system in which the answer is reversed. Justify your answer again. **1^{pt(s)}**