Problem 2: A Man Waking on a Platform

A man of 100 kg is standing on the rim of a platform of mass 1000 kg that is rotating at an angular speed 2 rad/s. The platform acts like a solid disk with radius 10 m and has perfect bearings. (The moment of inertia of the platform is $I_p=1/2MR^2$.) After enjoying the view for a minute or two, the man walks slowly towards the center of the platform.

1. What is the moment of inertia of the man, I_{mi}, when he is standing on the rim?

2. What is the total moment of inertia of the system (platform + man), I_i, when the man is standing on the rim?

3. What is the total angular momentum of the system, $\mathbf{L}_i$, when the man is standing on the rim?

4. What is the momentum of inertia of the man, I_{mf}, when he is halfway from the rim to the center?

5. What is the total momentum of inertia of the system, I_f, when the man is halfway from the rim to the center?

6. If the angular speed of the system is ω_f when the man is halfway from the rim to the center, what is the total angular momentum of the system, $\mathbf{L}_f$, at this moment?

7. The angular momentum of the system is conserved. Why?

8. With the information you obtained in 7, solve ω_f.

9. What is the initial rotation kinetic energy of the system, KE_i?

10. What is the final rotation kinetic energy of the system, KE_f?

11. How much work does the man do in moving halfway to the center?