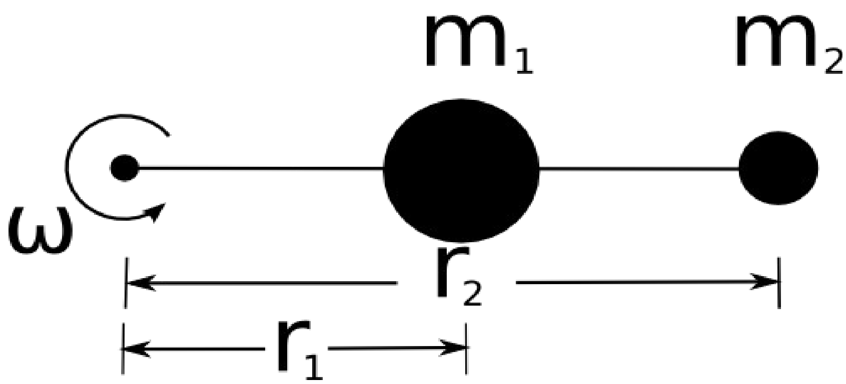
Rotation – Set 2

Name ____________________ Pages Solved _____/ 8

Consider a thin (essentially massless) bar with two masses attached to it as pictured below. The bar is rotating about the point shown in the diagram with an angular velocity ω.



a) Write an expression for the total kinetic energy of the system in terms of r_1, r_2, and ω. Simplify your expression as much as possible.

b) Generalize the expression above to a system with *n* masses (use a summation symbol, Σ, in your expression).

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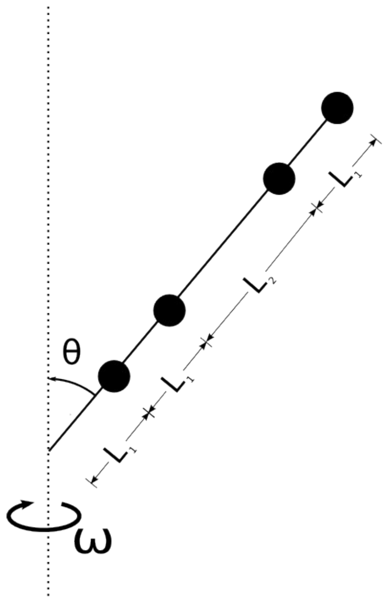
Four point masses, each of mass m, are attached to a rigid massless rod that makes an angle θ with the axis of rotation. Let $L_2 = 2L_1$.

a) What is the moment of inertia of this system?
b) What is the kinetic energy of this system if it's rotating with angular velocity ω.



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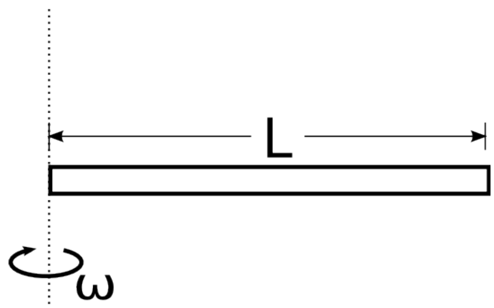
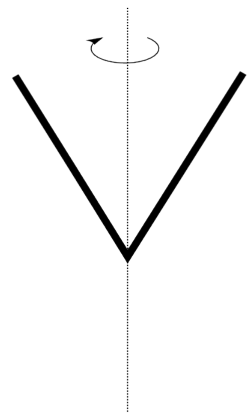
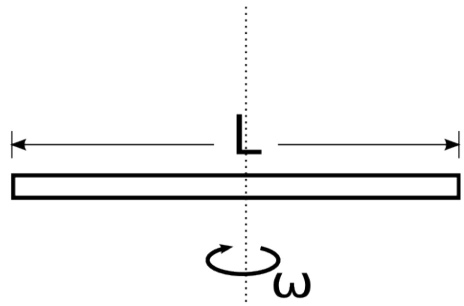
Calculate the moment of inertia of a uniform bar of length L and mass M about the axis of rotation shown.



Calculate the moment of inertia of the bent rod of mass **M** shown in the figure below. The rotation axis is in the plane of the "V" bisecting it at the vertex. The rod is bent at an angle **θ** and each leg has a length **L**.

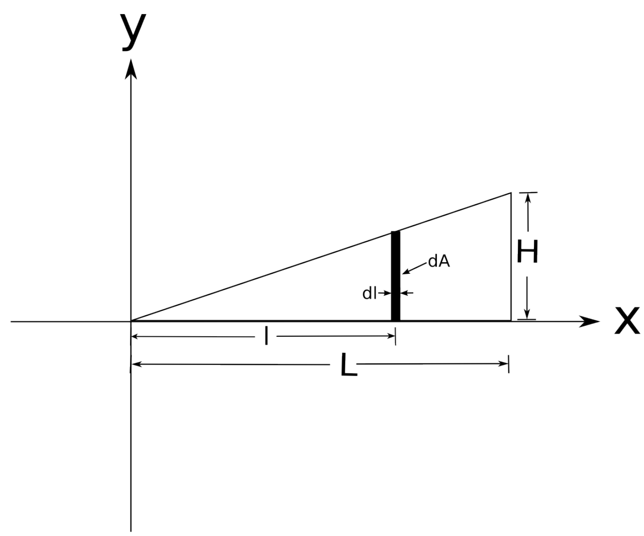


Calculate the moment of inertia of a uniform bar of length L and mass M about the axis of rotation shown.



Consider a triangular chunk of aluminum of mass *M*, length *L*, and height *H*.

a) Calculate its moment of inertia, *I*, about the x axis.
b) Calculate its moment of inertia, *I*, about the y axis.

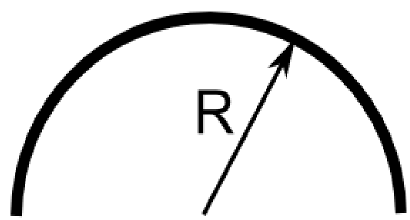


A thin rod of mass M has been bent into a semi-circle with radius R.

a) Calculate its center of mass

b) Calculate its moment of inertia about an axis through the center of the circle (at the tail of the radius vector) perpendicular to the page.

c) Calculate its moment of inertia about an axis in the plane of the page that vertically bisects the semi-circle.



Consider a thin disk of mass M and radius R.

a) Calculate its moment of inertia, I, about an axis through its center of mass perpendicular to the surface of the disk.

b) Calculate its moment of inertia, I, about an axis through its center of mass parallel to the surface of the disk.