

5.0: Model Specifics

We are now ready to consider how the actual size and shape of an object affects its motion. The most immediate ramification of this Model is that the objects we study can now **rotate**. However, there are still three important restrictions to the types of motions will we investigate.

The object is rigid.

The size and shape of the object under investigation do not change during the motion.

The rotation is planar.

This restriction may take some explaining. Imagine an object spinning in place. The axis (real or imaginary) about which the object spins is referred to as the rotation axis. Note that all points that lie on the rotation axis do not move. All other points on the object, however, exhibit circular motion around the rotation axis.

If the object, in addition to spinning, is also moving, this model will restrict us to motions where the center-of-mass moves exclusively in the plane perpendicular to the rotation axis. I will refer to this as *planar rotation*.

For example, a yo-yo is an object that typically moves in a plane perpendicular to its rotation axis. Thus, we can study the motion of most yo-yos. The motion of a wheel is typically in a plane perpendicular to its rotation axis. Thus, we can study the motion of most wheels. The motion of the earth around the sun, however, is beyond this model's capabilities since the rotation axis of the earth is tilted relative to the plane of the earth's motion. A wobbling top is also beyond this model's capabilities (although a steadily spinning top is not).

The object is classical.

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