47.2: Conservation of Angular Momentum

Angular momentum, like linear momentum, is a conserved vector quantity: in a closed system (in which no angular momentum enters or leaves the system), the total angular momentum is constant. Since angular momentum is a vector, this means that the following are all conserved:

- The vector angular momentum, $\mathbf{L}$;
- The magnitude of the angular momentum, L; and
- Each component of the angular momentum, L_x, L_y, and L_z.

In a closed system, angular momentum may be transferred from one body to another, but the total angular momentum - the sum of the angular momenta of all bodies in the system — will remain constant.

As a common example, conservation of angular momentum is illustrated by the spinning of a figure skater. As she's doing a spin, a figure skater will rotate about a vertical axis. As she brings her arms in closer to her body, the figure skater decreases her moment of inertia. By Eq. 47.1.3, if the moment of inertia I decreases, then the angular velocity ω must increase in order to keep the angular momentum L constant.