In the angular momentum equation L = r x p, which one of the remaining variables' magnitudes is correctly conserved when the magnitude of the radius changes?

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Abstract:

Both angular momentum and momentum are generally accepted by scientists to be conserved values, and both of these variables are contained within the equation L = r x p (variables are as defined in the reference work). Assuming that the implied rotation occurs around a fixed central point, the magnitudes of angular momentum and momentum cannot both be conserved when the magnitude of the radius changes. The generally accepted principle is that the magnitude of the momentum must change in order to conserve angular momentum. However, it is logically proven that it is the magnitude of the component of momentum perpendicular to the radius that must be conserved.

Introduction:

While working on a project that did not achieve the results predicted, I discovered this oversight within the laws of physics.

Proof:

For the equation L = r x p[1], assuming that the implied rotation occurs around a fixed central point which we will refer to as the center of rotation. We also refer to the vector r as the radius.

Premise 1:

There is a force at all times directed from the point mass along the radius toward the center of rotation (centripetal force).

Premise 2:

A change in the magnitude of the radius is conducted by altering the magnitude of this force.

Premise 3:

There can be no component of this force perpendicular to the radius.

Premise 4:

In order to affect the magnitude of the component of momentum perpendicular to the radius, one must apply a parallel component of force (Newton's first law).

Deduction:

A change in the magnitude of the radius cannot affect the magnitude of the component of momentum perpendicular to the radius.

Conclusion:

In the equation L = r x p, assuming that the implied rotation occurs around a central point, it is the cross product of momentum (x p) element of the equation that must be conserved when the magnitude of the radius changes.

References:

1) D. Halliday & R. Resnick, Fundamentals of Physics, second edition, extended version (John Wiley & Sons, Inc., New York, 1981) p. 181.