

My question to ChatGPT: (on July 30, 2025)

Can a 4D rock rotate in two plains independently of each other? That is, accelerating and decelerating independently?

Its answer:

Yes, in four-dimensional space, a 4D object (like a "rock") can indeed rotate in two independent planes, and the rotations can accelerate and decelerate independently, much like how an object in three-dimensional space can rotate around two axes simultaneously (like the way a gyroscope behaves).

To understand this better, consider that in four dimensions, there are six independent planes of rotation, as you have four spatial dimensions. These planes are formed by pairs of the four axes, and an object in four-dimensional space can experience rotational motion in any of these planes. Two of these planes could rotate independently of one another, meaning that one could rotate in a clockwise direction while the other rotates in a counterclockwise direction (or vice versa). The key idea is that the motion in each plane is independent of the other, so the object could accelerate and decelerate in each plane without affecting the other rotation.

For instance:

You might have one plane in which the object is spinning clockwise, and the other plane might be rotating counterclockwise.

One plane could experience a change in rotational speed (acceleration or deceleration) while the other remains unaffected, or it could experience its own independent change in speed.

This independence of motion is a consequence of the additional freedom that comes with an extra dimension. In 3D, an object is constrained to rotate around an axis (which is essentially a line), while in 4D, an object can rotate around planes (which are 2D surfaces), and these rotations don't have to be coupled.

In summary:

Yes, a 4D rock (or any object in 4D space) can rotate in two independent planes, and these rotations can indeed accelerate and decelerate independently. This is because the rotational degrees of freedom in four-dimensional space are more flexible than in three dimensions.