

# The Theoretical Minimum

## Classical Mechanics - Solutions

I01E06

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**Exercise 1.** *Can you explain why the dot product of two vectors that are orthogonal is 0?*

The dot product between two vectors is defined in two ways in the book; one of them involves the magnitudes of the vectors and the angle between them:

$$\mathbf{u} \cdot \mathbf{v} = \|\mathbf{u}\| \|\mathbf{v}\| \cos \theta_{uv}$$

By definition, two vectors are orthogonal if the angle between them is  $\pi/2$ , or  $90^\circ$ . But,  $\cos(\pi/2) = 0$ , so it follows from the previous dot product formula that, for two orthogonal vectors, their dot product must be 0.