

April 5, Week 11

Today: Chapter 9, Angular Velocity

Homework Assignment #8 - Due Monday, April 8

Mastering Physics: 8 problems from chapter 8

Written Questions: 8.101

Homework Assignment #9 - Due Friday, April 12.

Mastering Physics: 7 problems from chapter 9

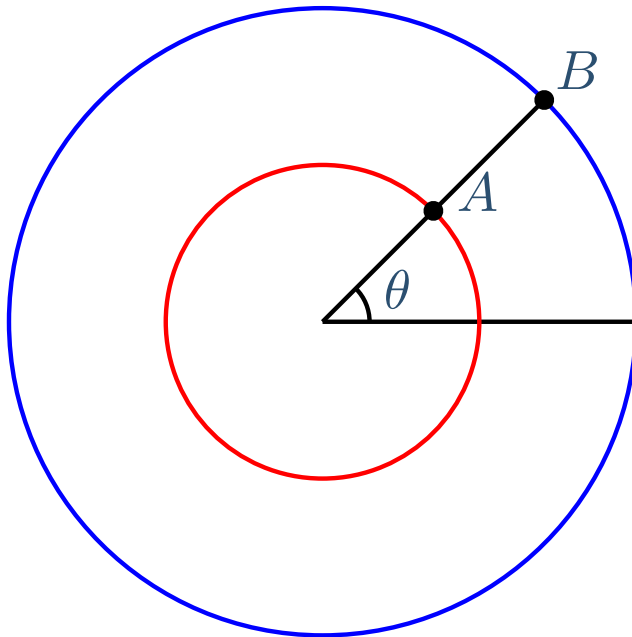
Written Questions: 10.80

Angular Motion

While A and B travel different distances, they are always at the same angle.

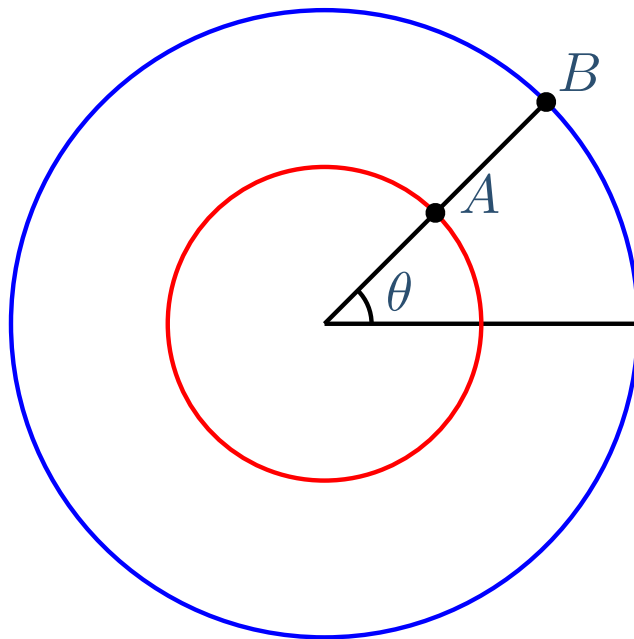
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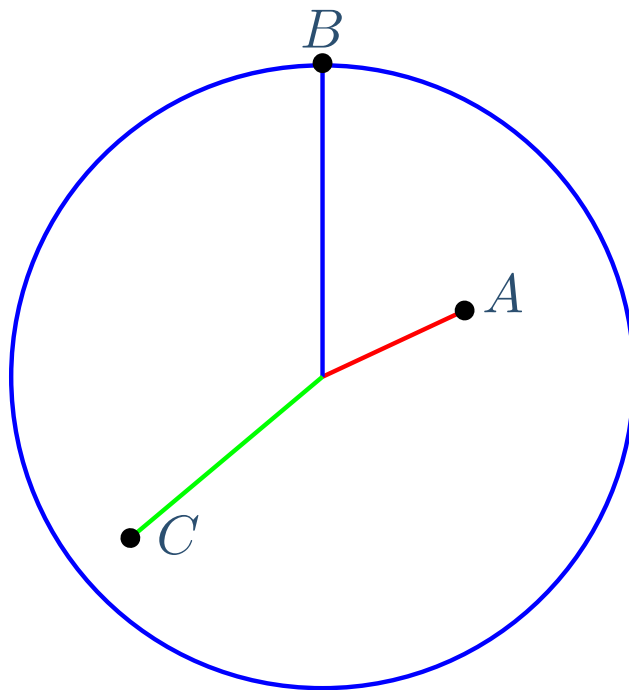
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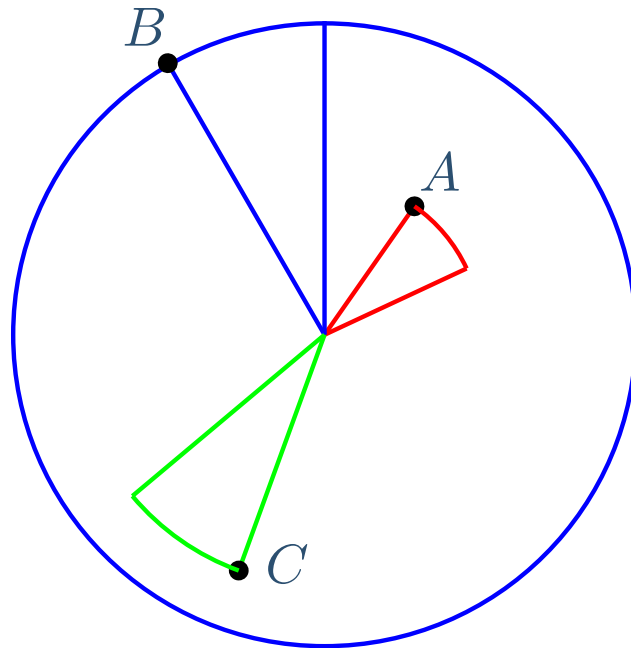
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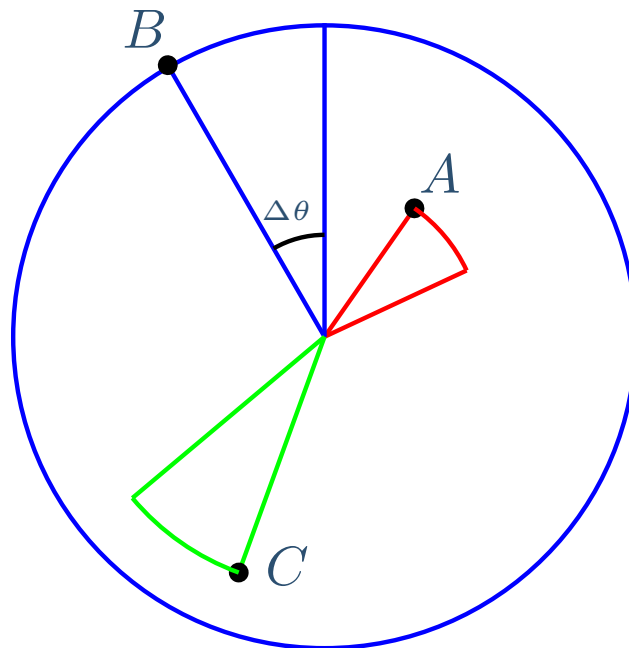
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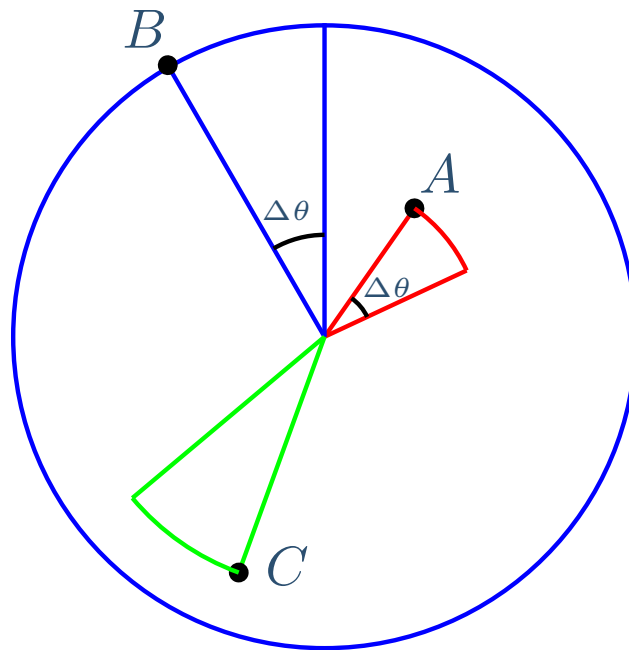
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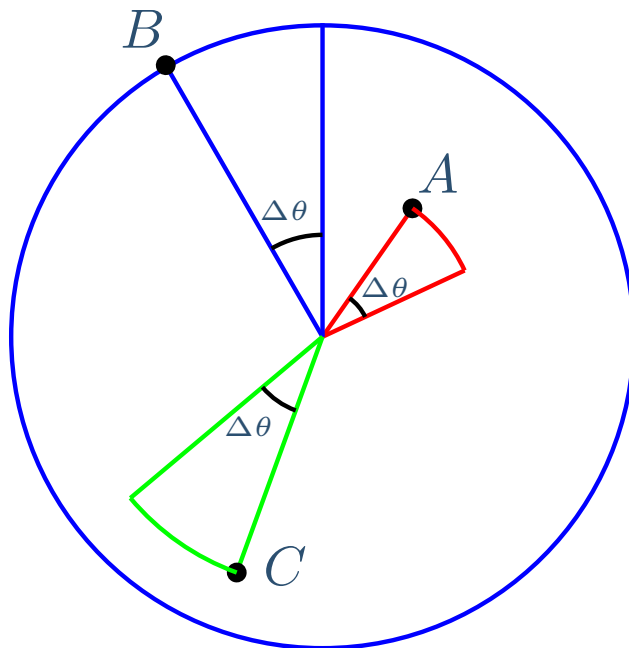
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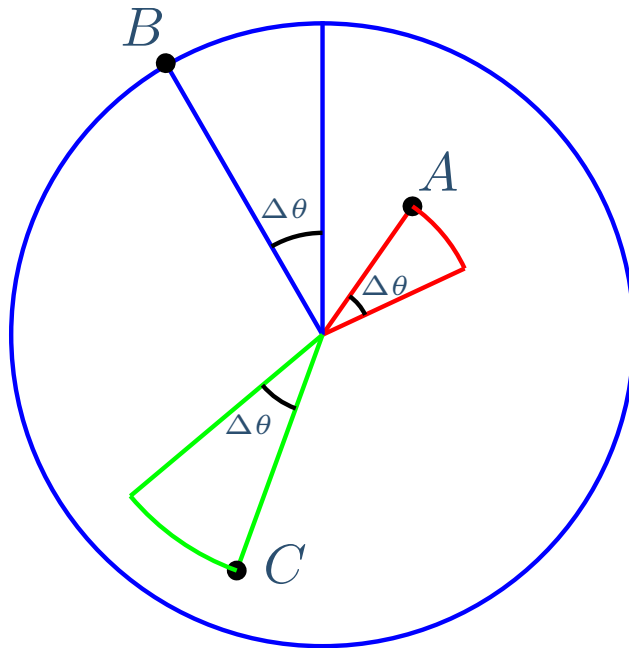
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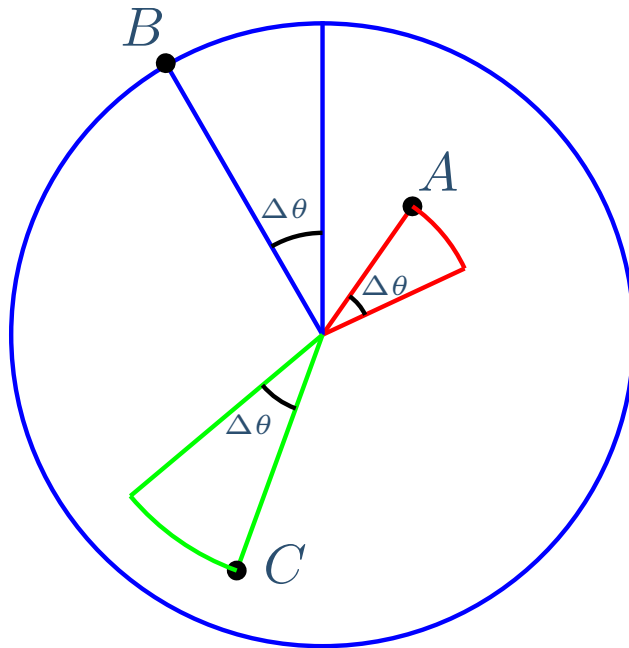


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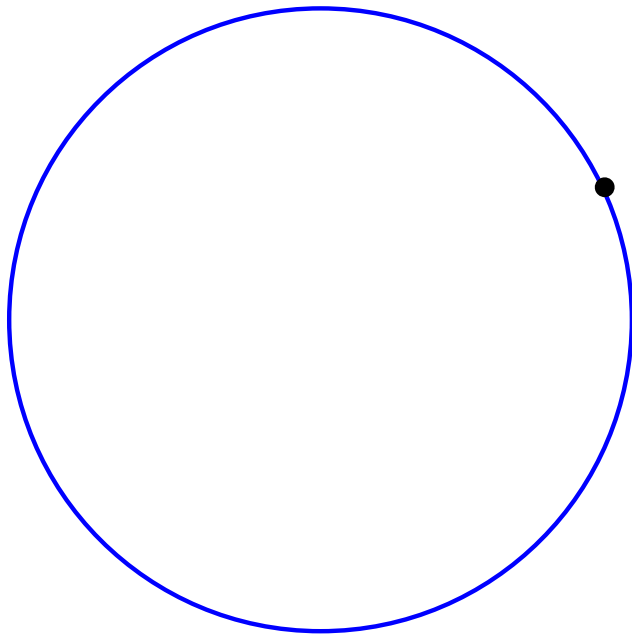
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A rotating object has infinitely many linear speeds but only one angular speed

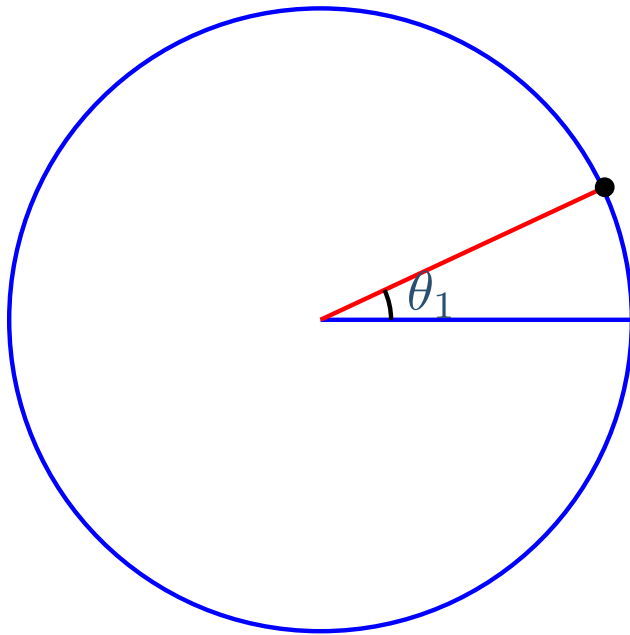
Angular Velocity

The rate at which a particle circles is given by its angular velocity, ω .



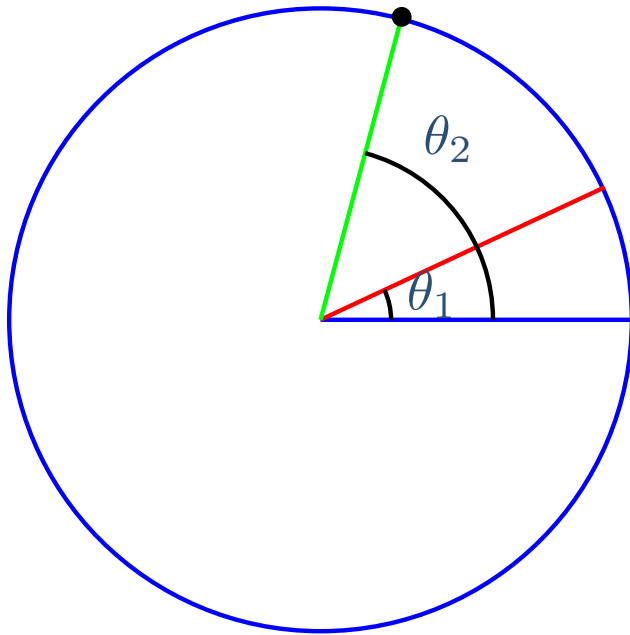
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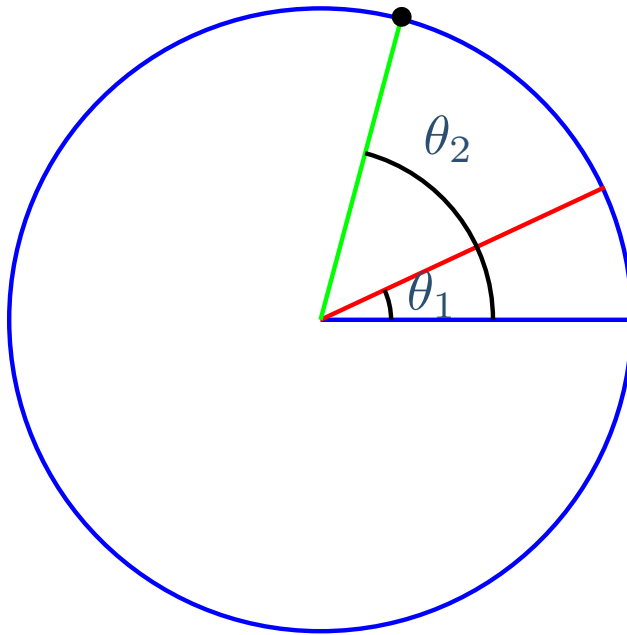
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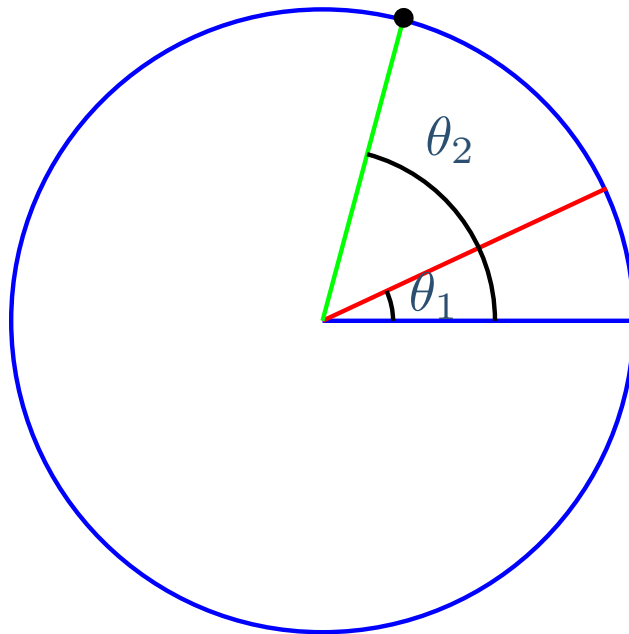
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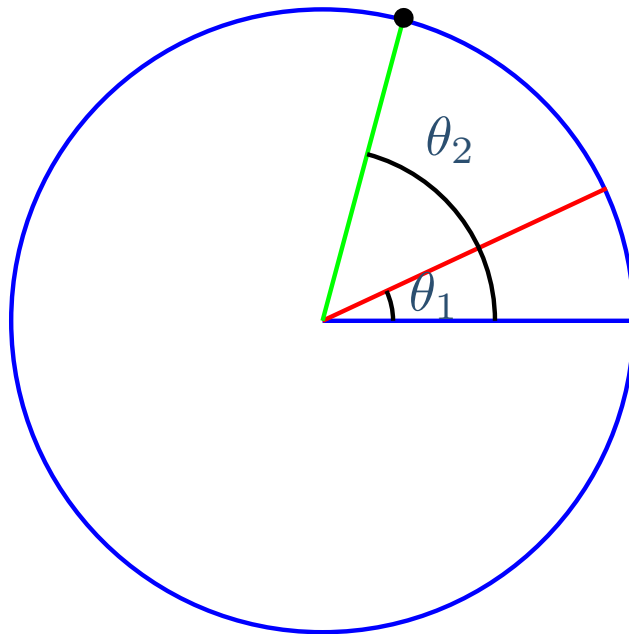


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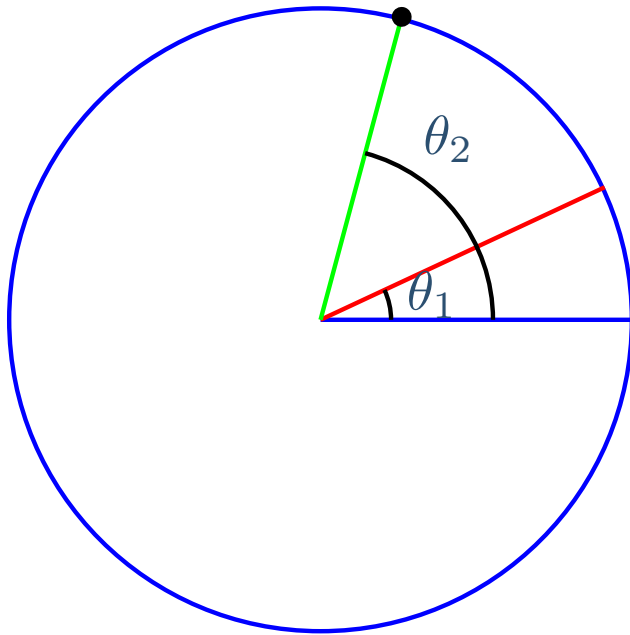
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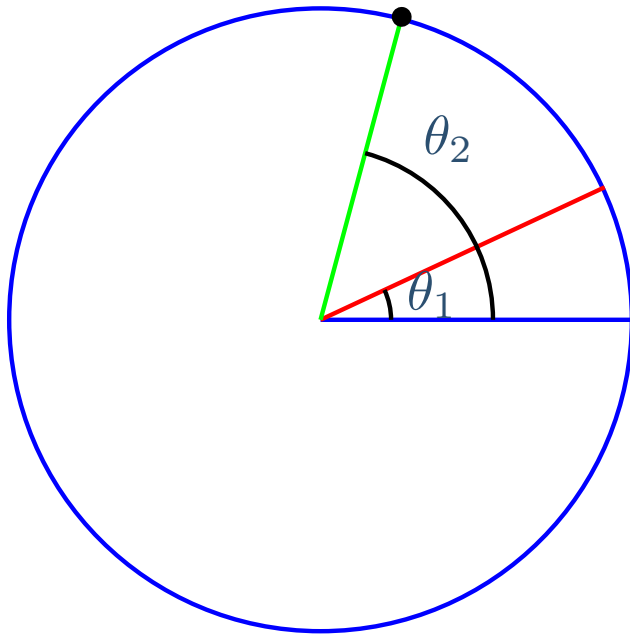
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$$\omega = \lim_{\Delta t \rightarrow 0} \frac{\Delta\theta}{\Delta t} = \frac{d\theta}{dt}$$

Rotational Axis

All rotation occurs about an axis.

Rotational Axis

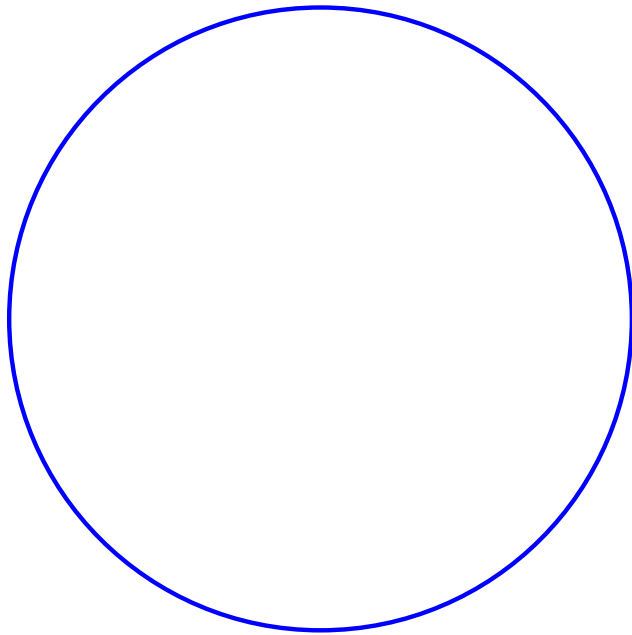
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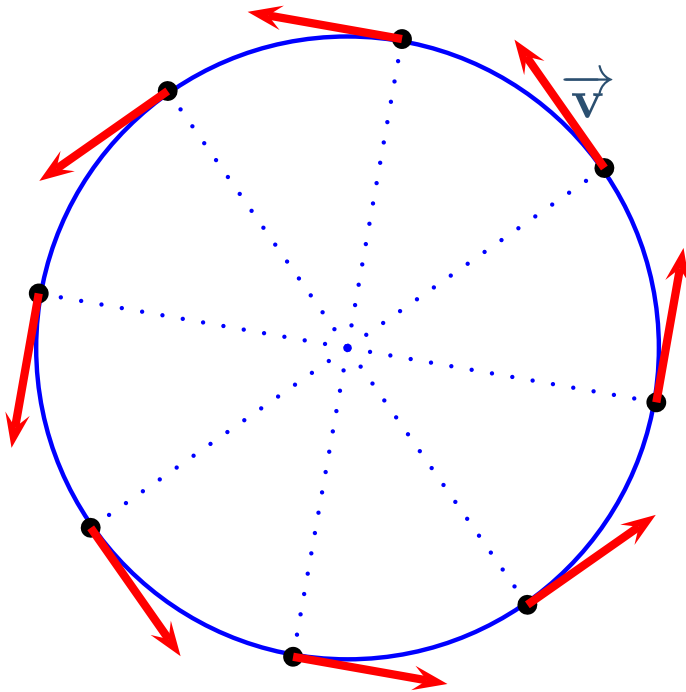


Perpendicular to motion
 $\Rightarrow 90^\circ$ to all \vec{v}

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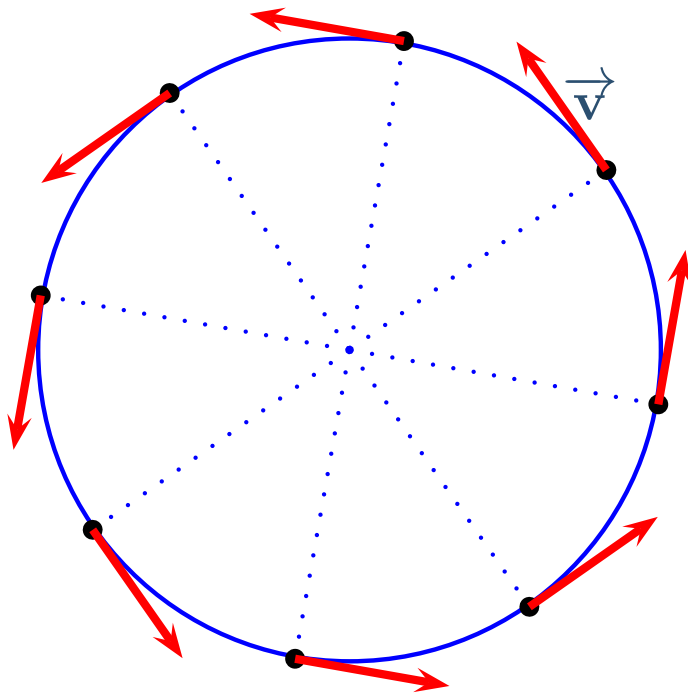


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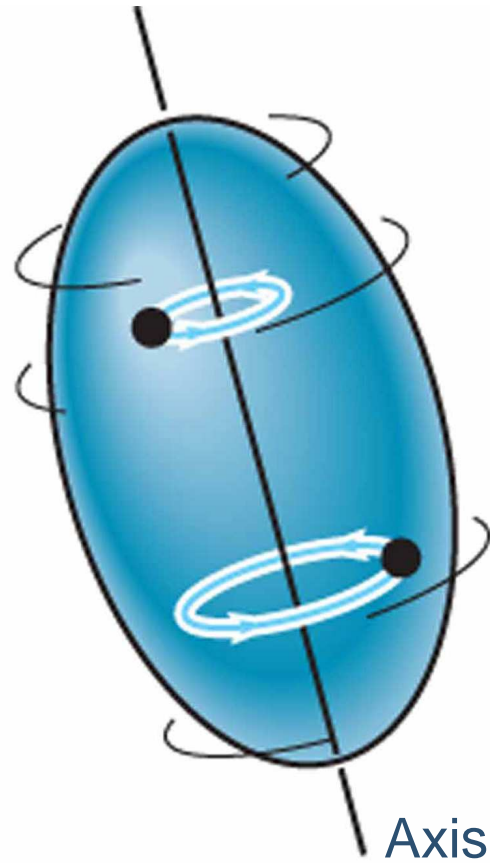
The rotational axis is along the z -axis,
i.e., into and out of the page

Rotational Axis II

Any rotation has an axis.

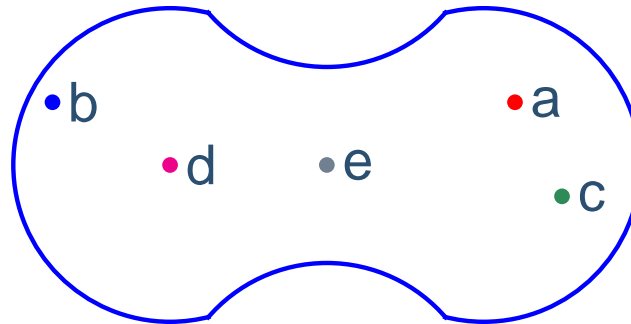
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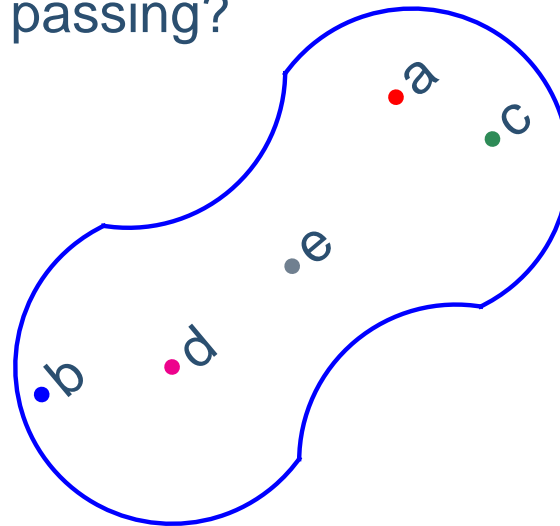
Axis Exercise

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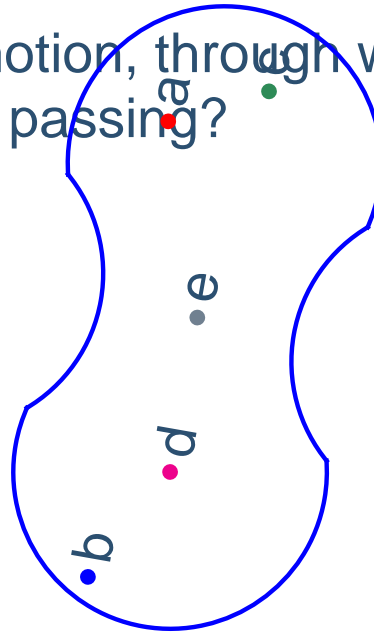
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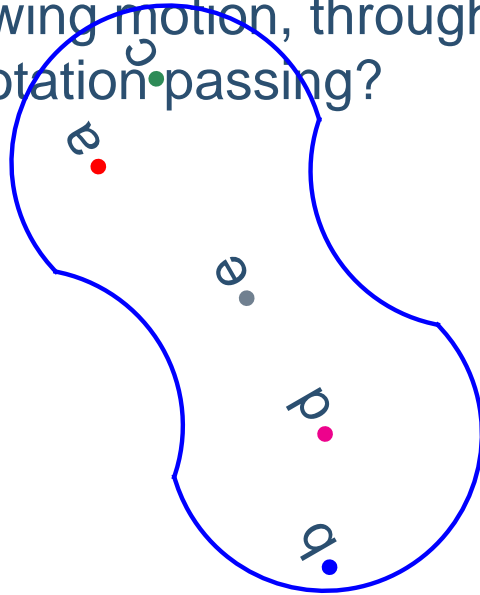
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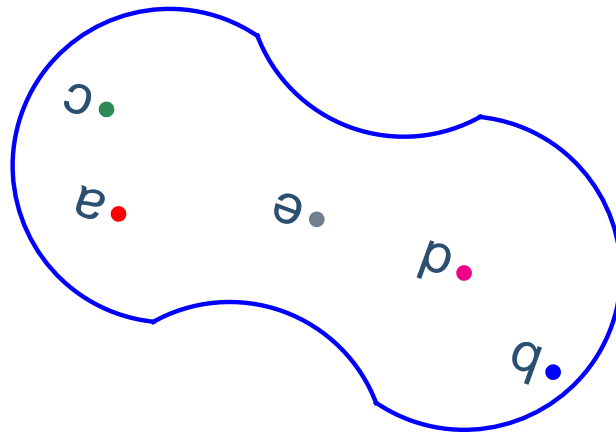
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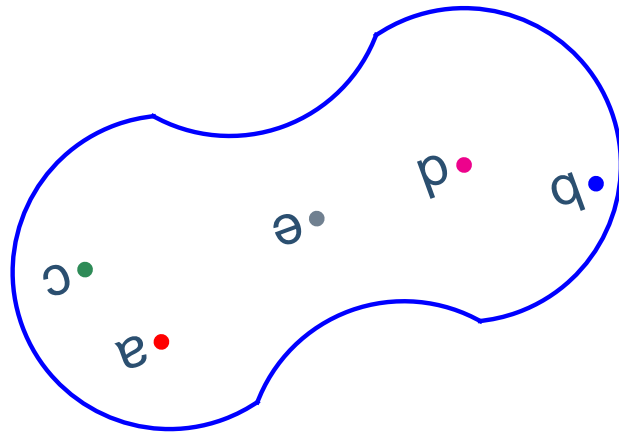
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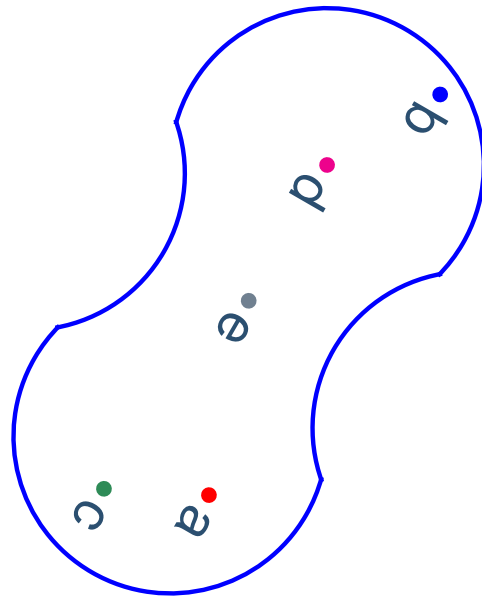
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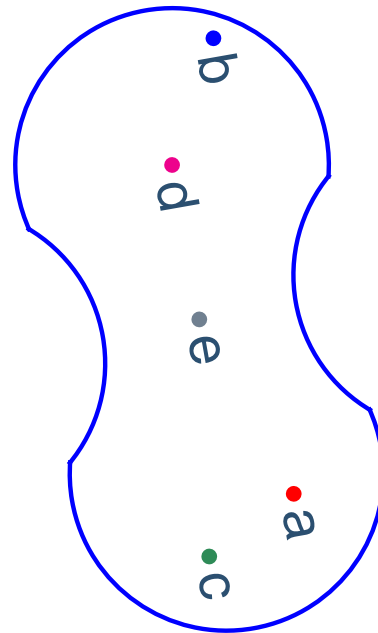
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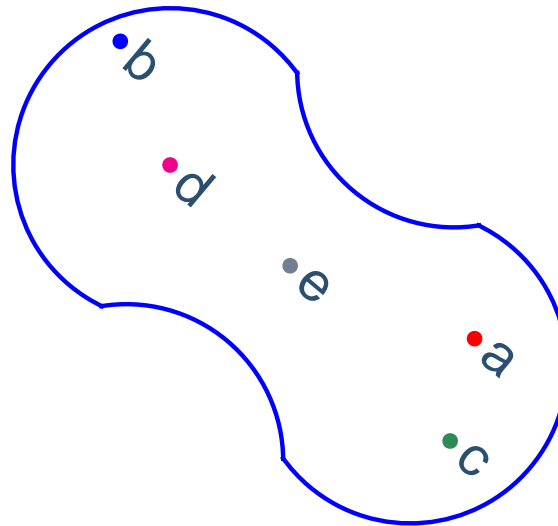
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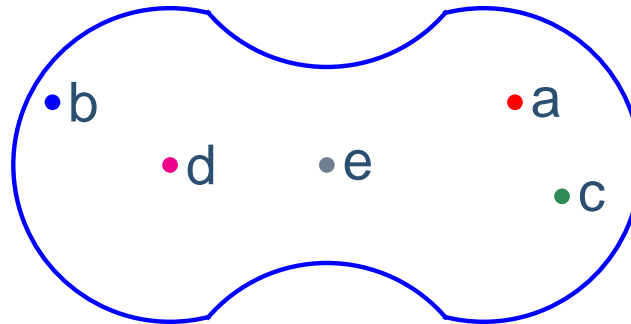
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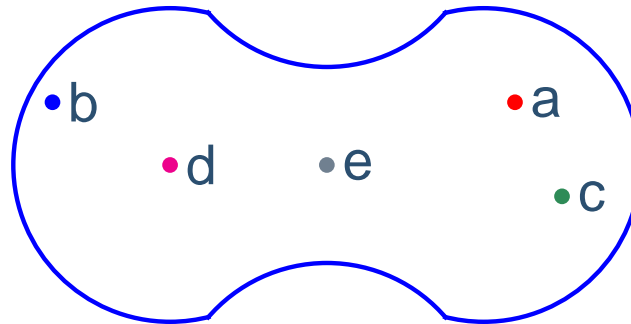
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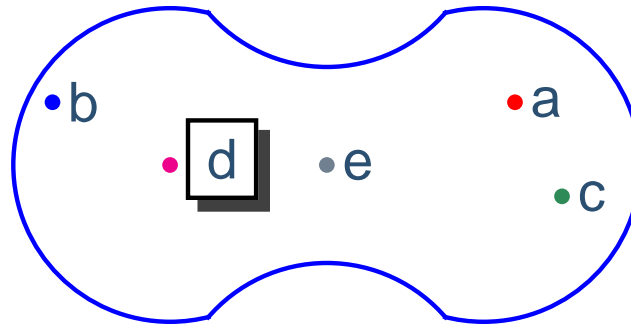
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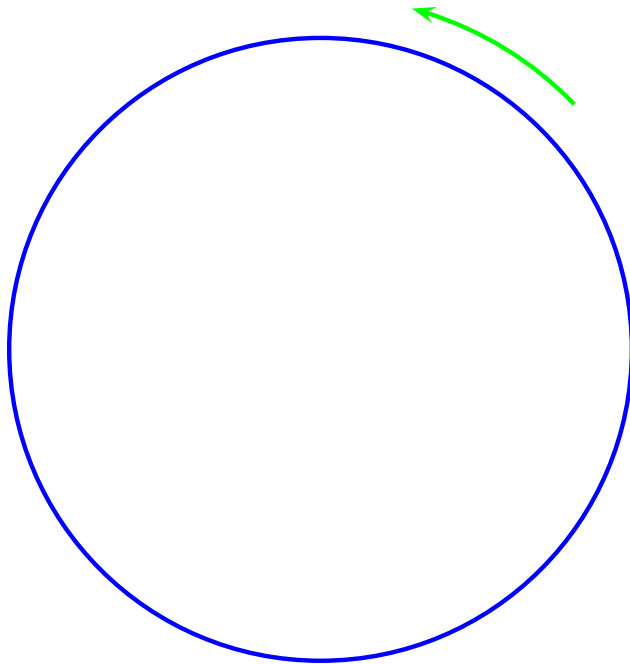
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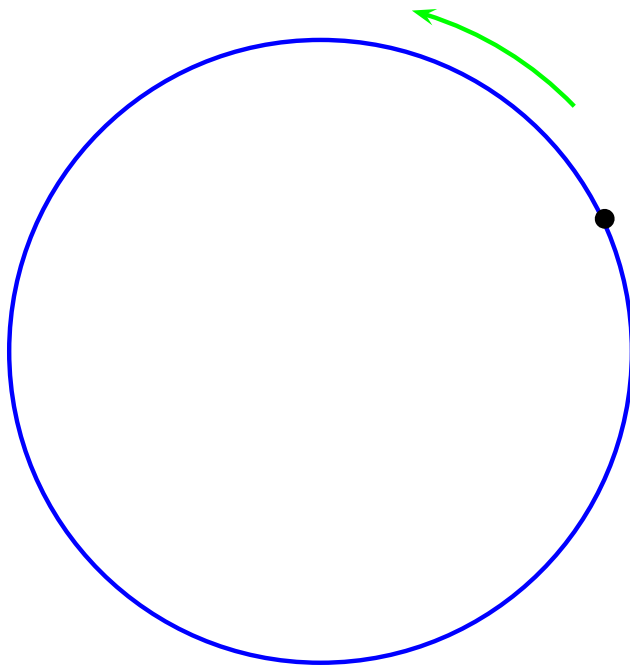


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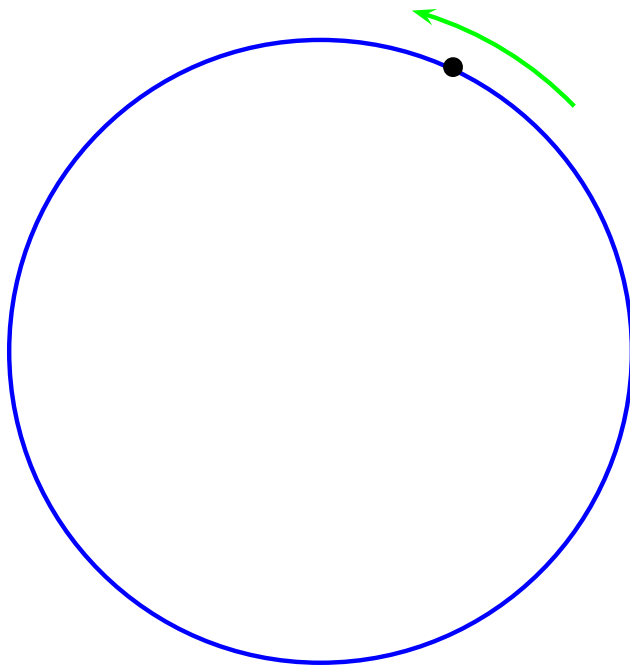


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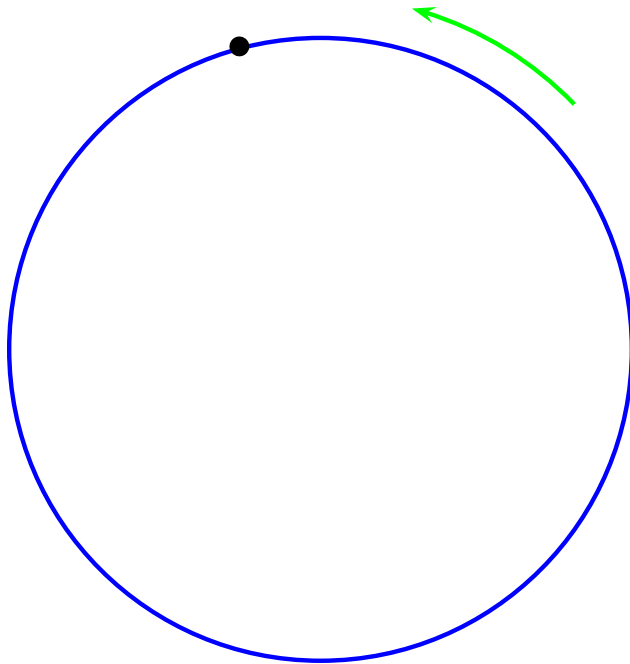


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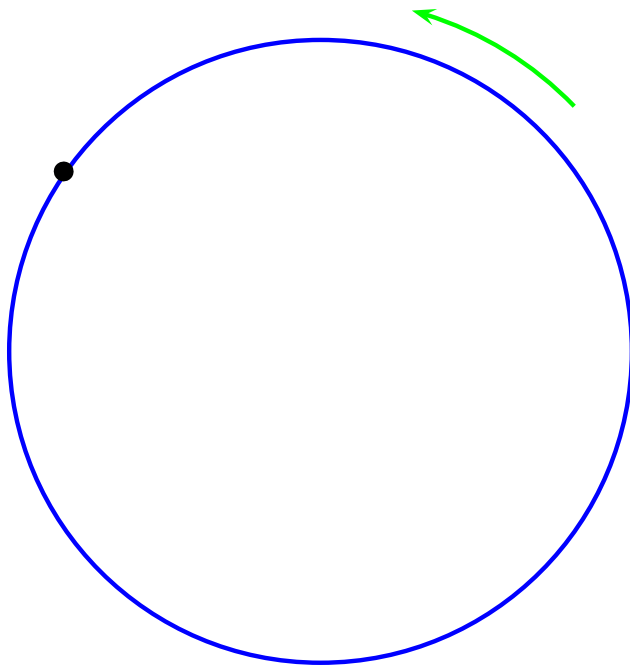


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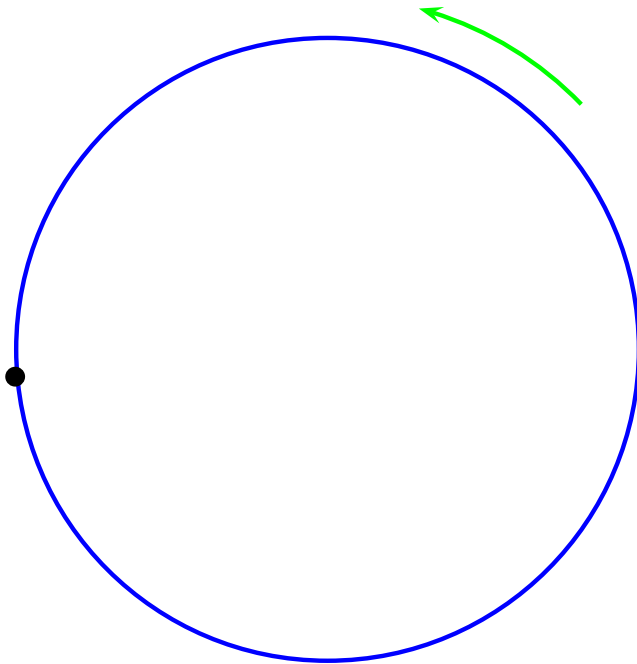


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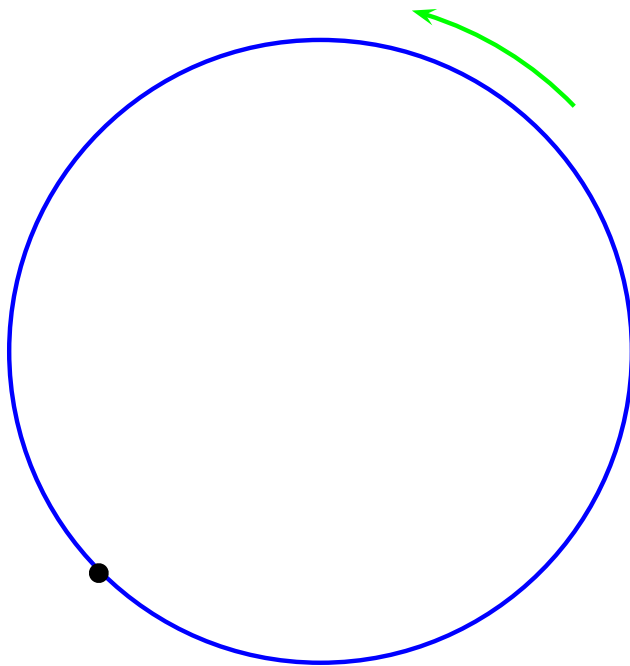


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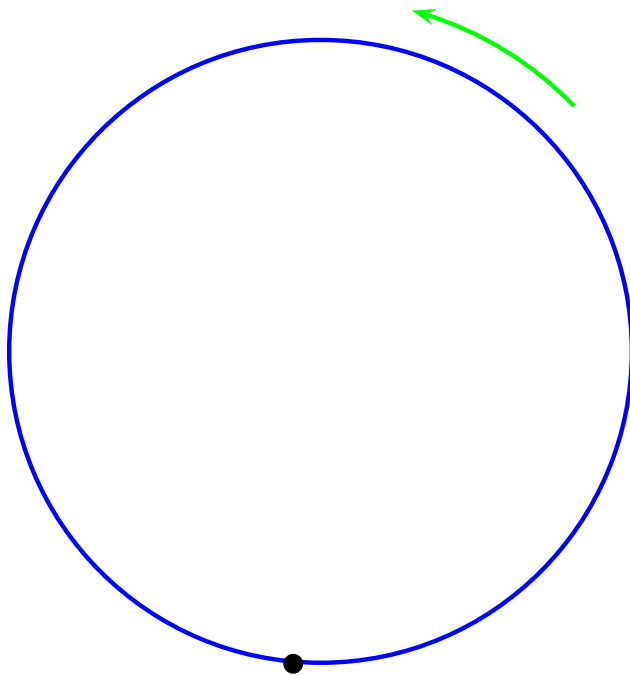


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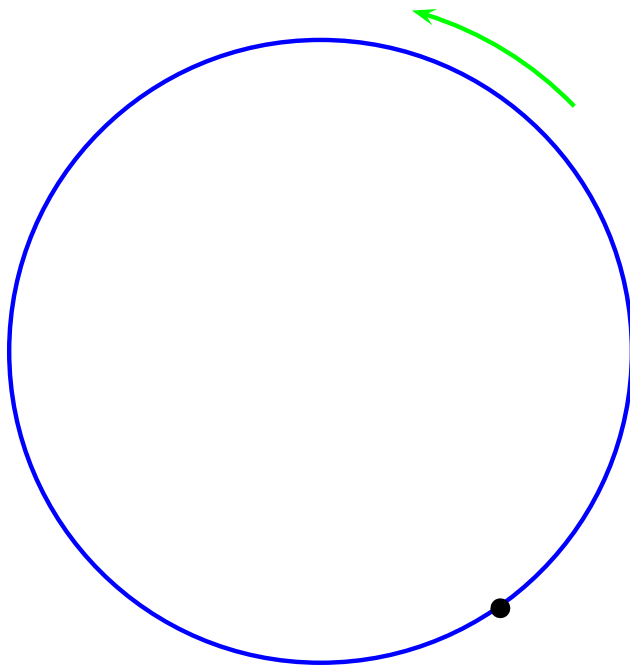


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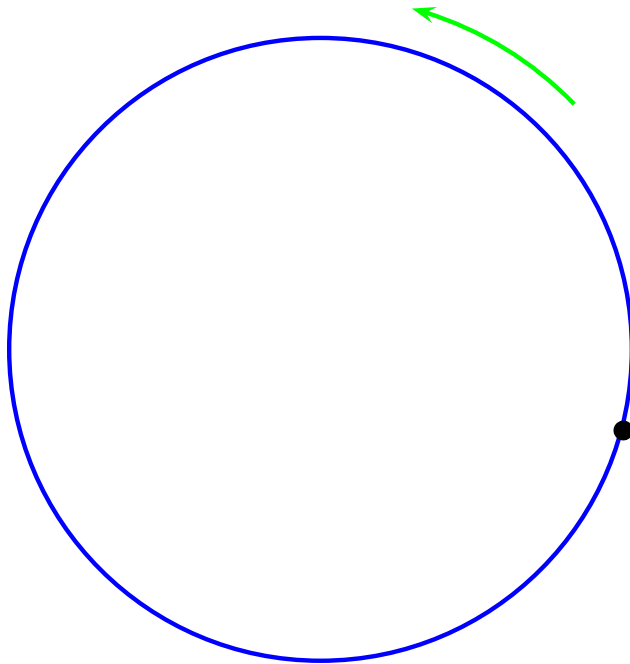


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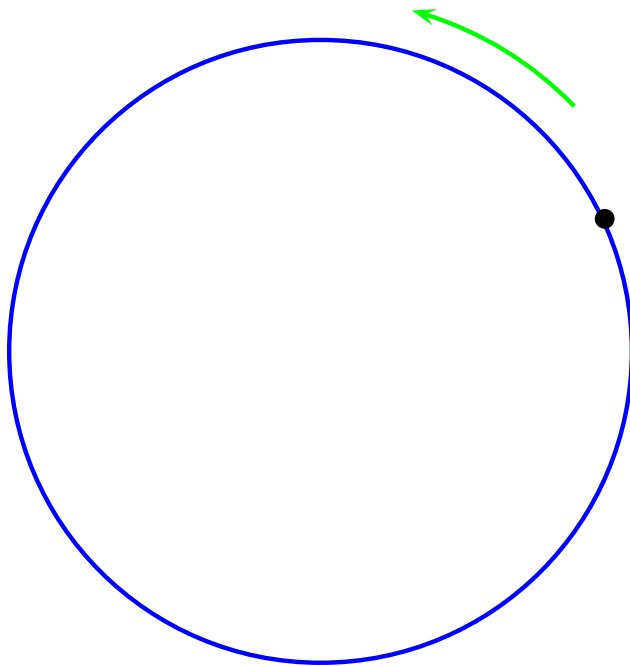


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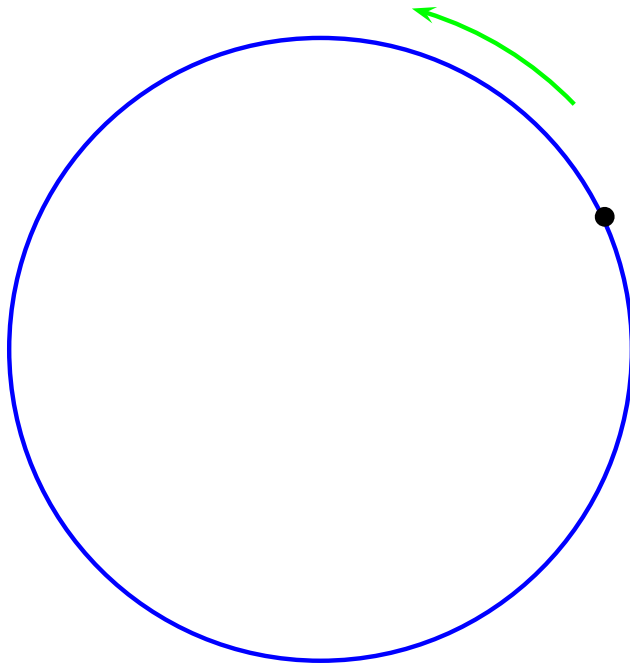


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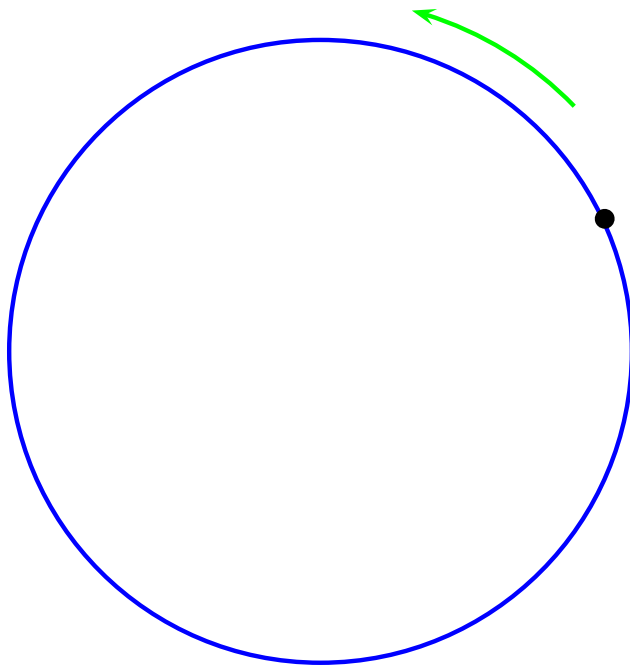
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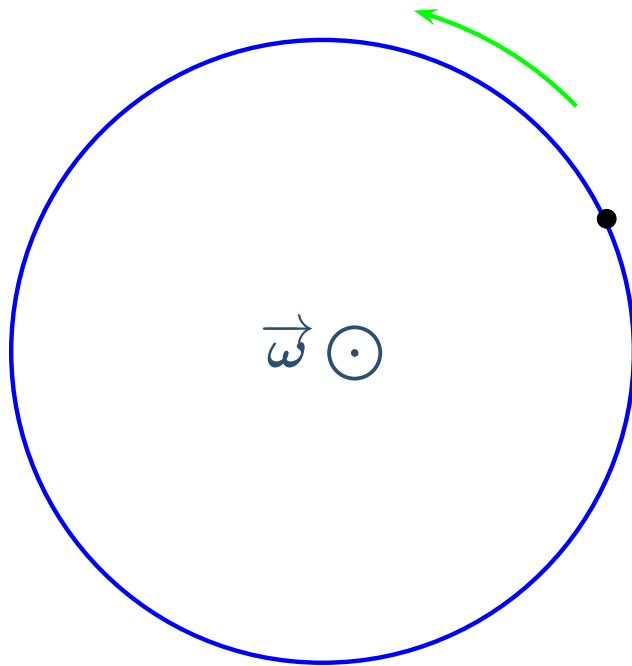
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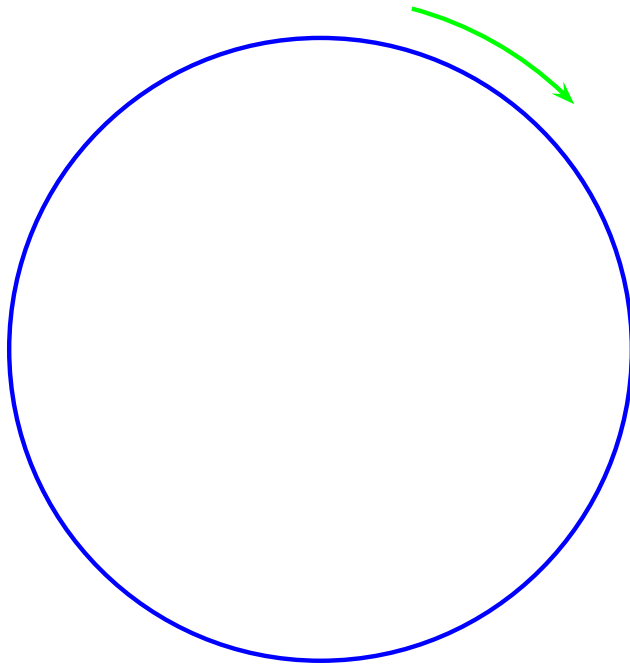
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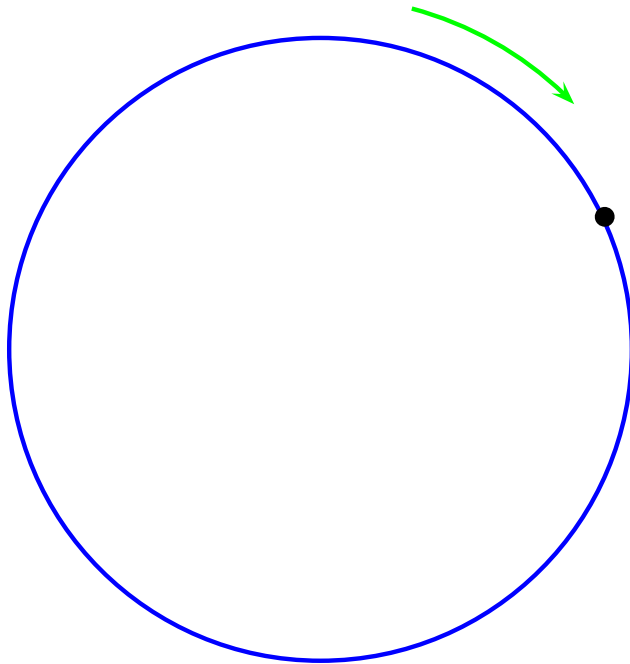


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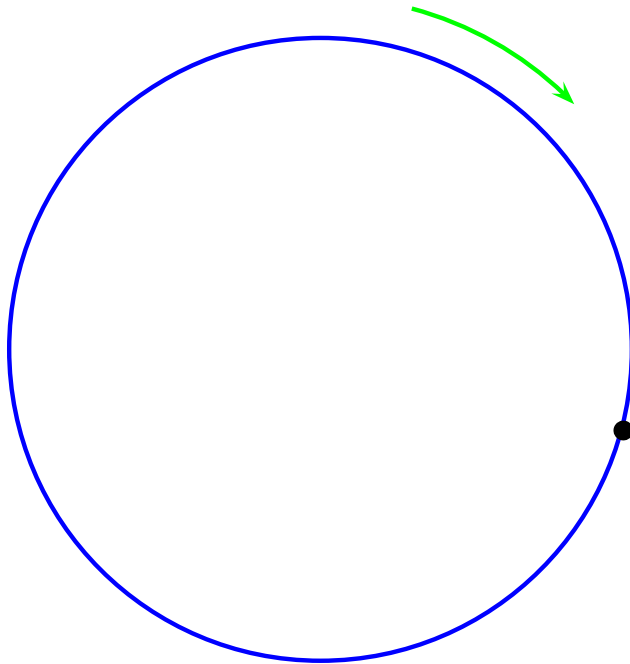


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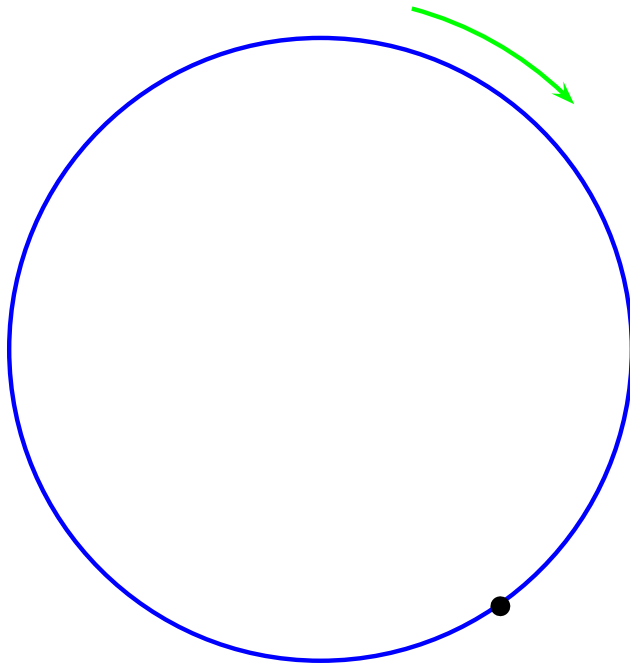


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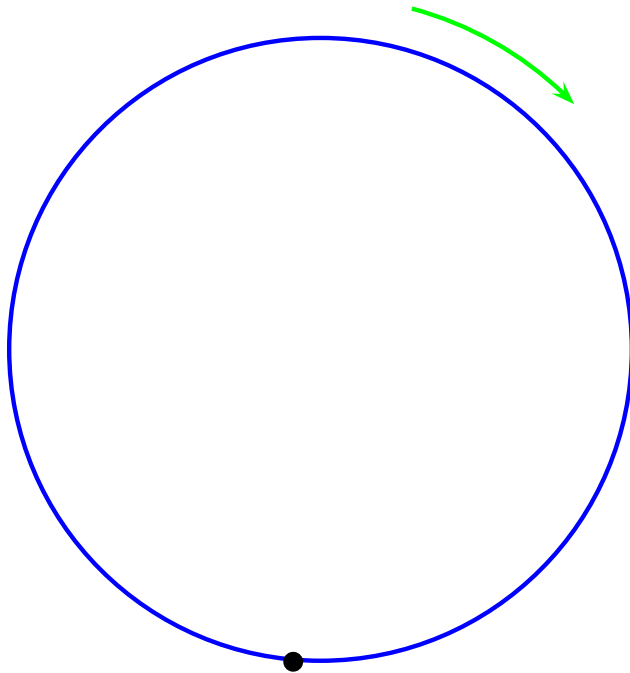


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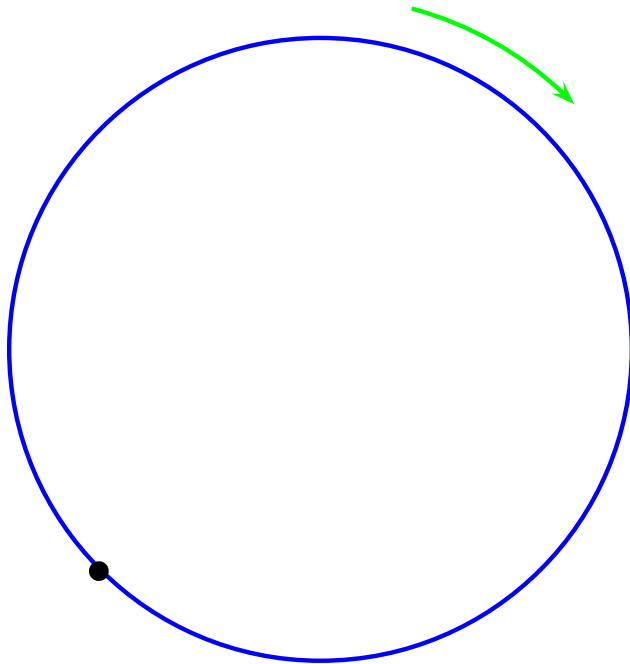


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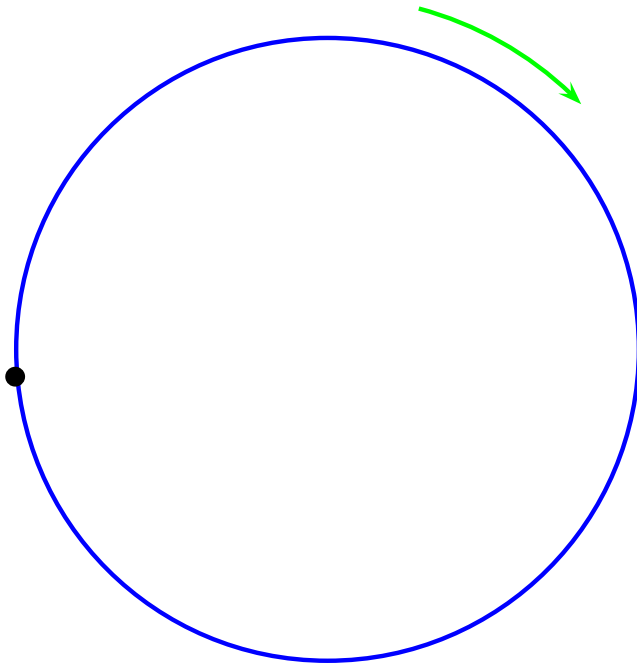


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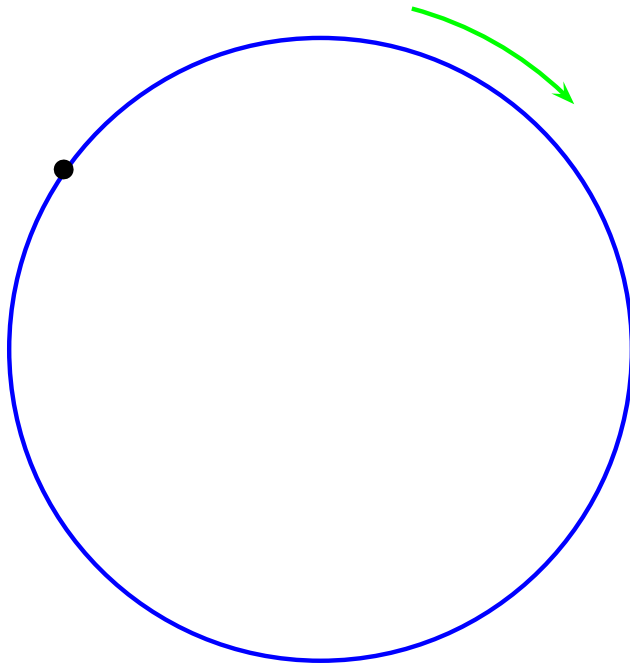


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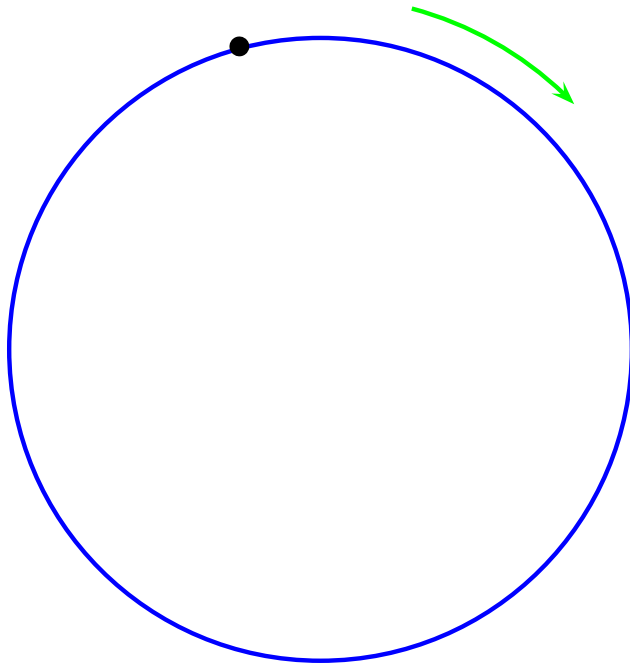


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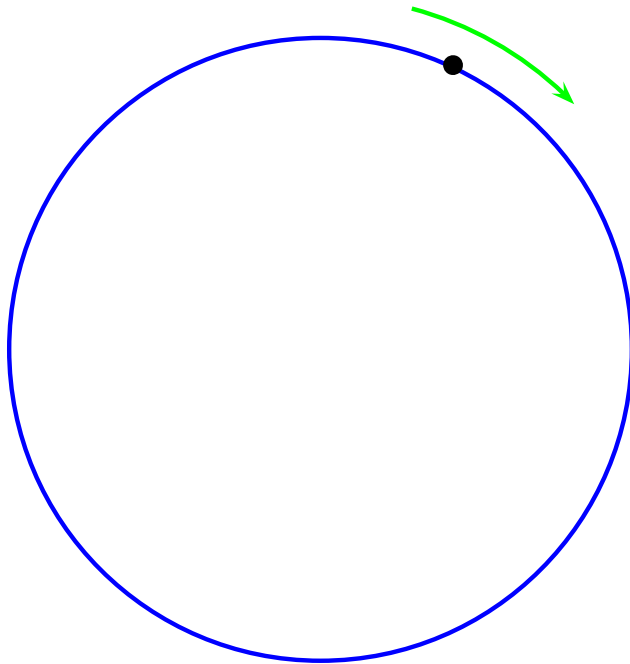


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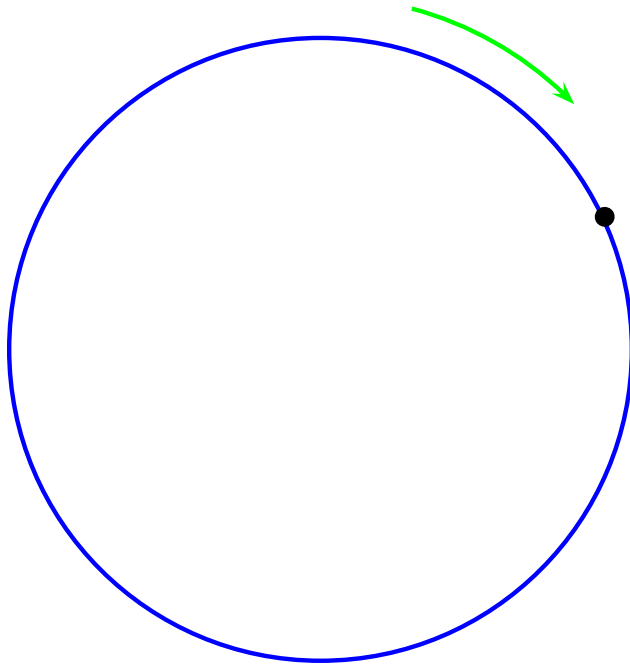


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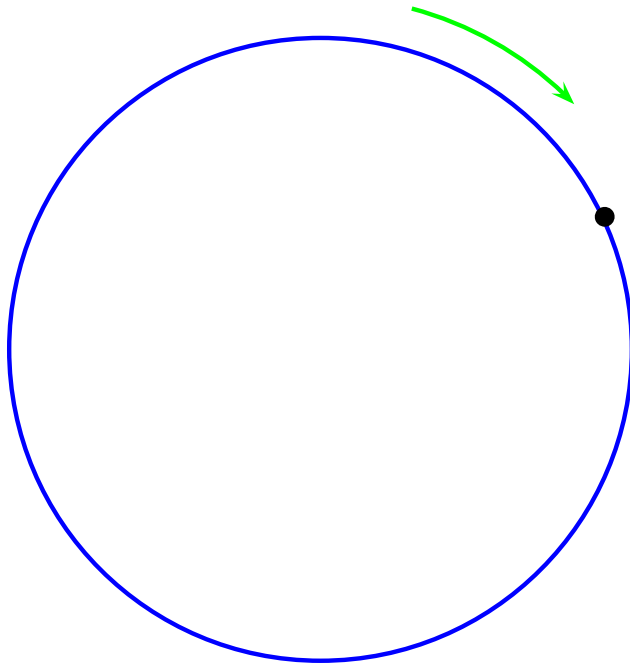


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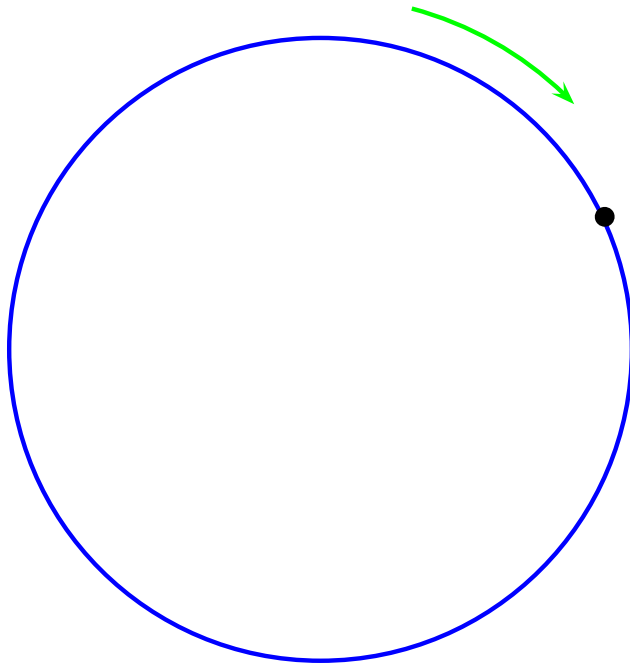
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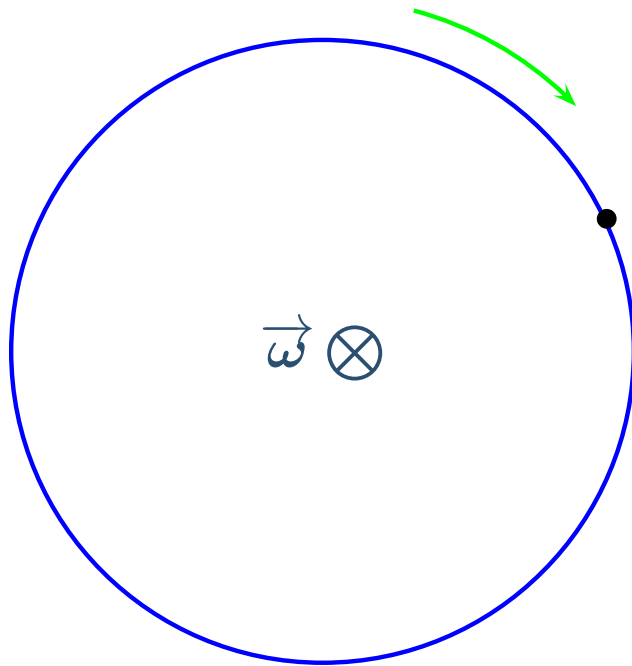
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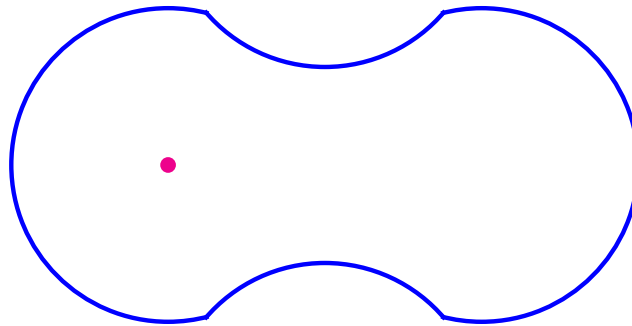
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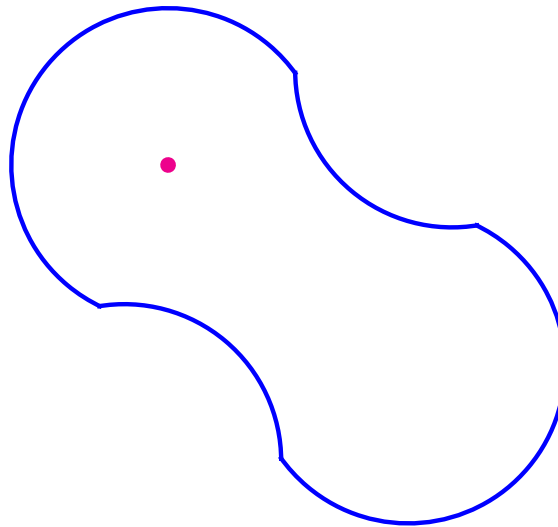
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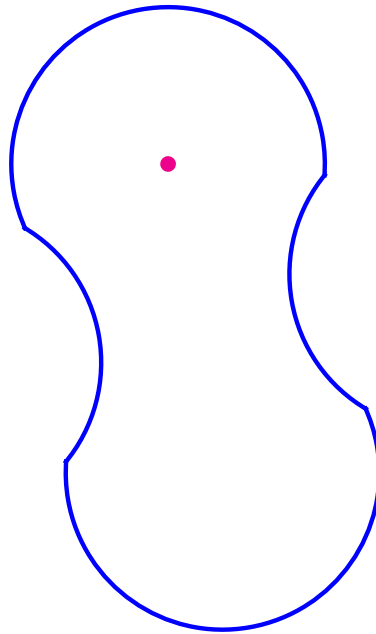
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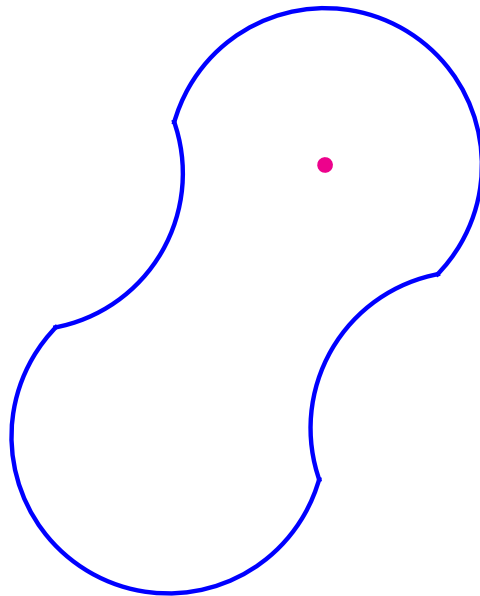
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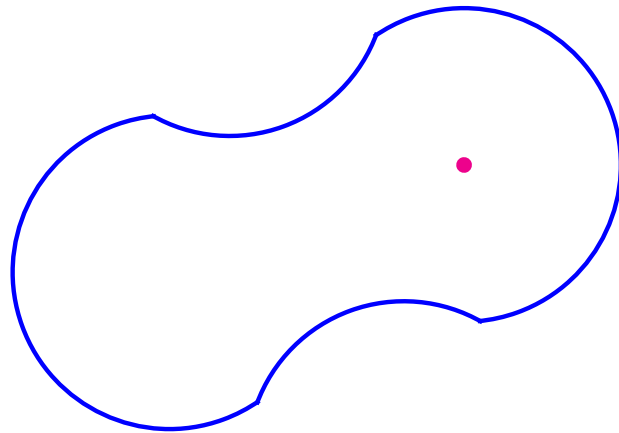
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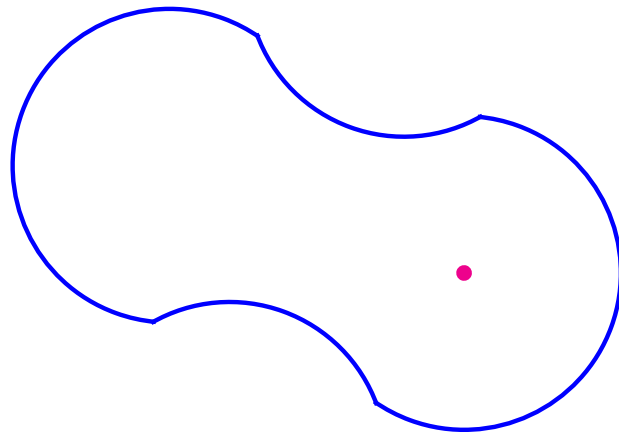
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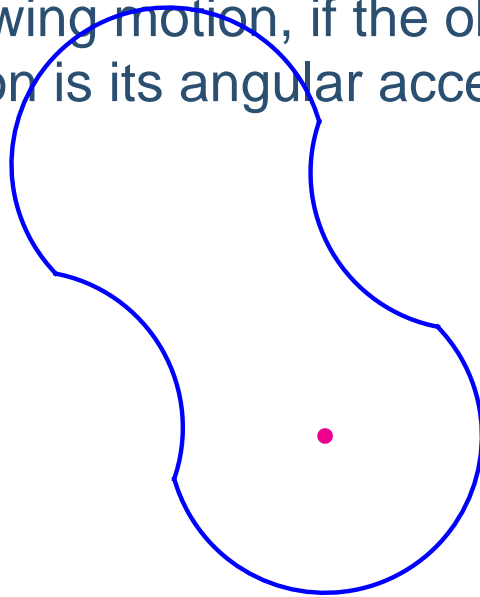
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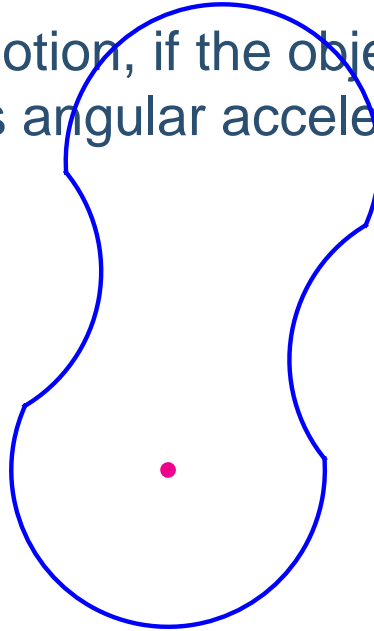
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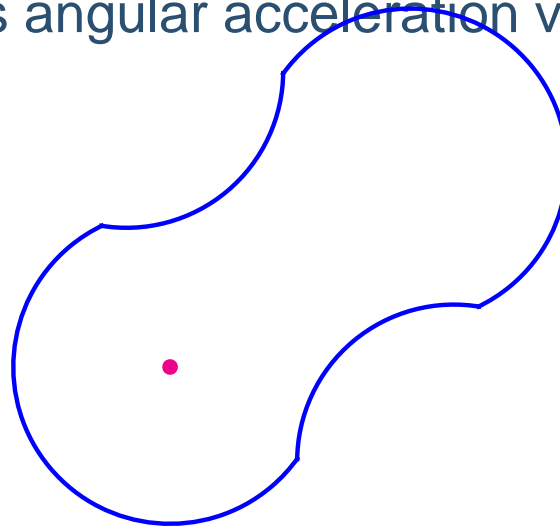
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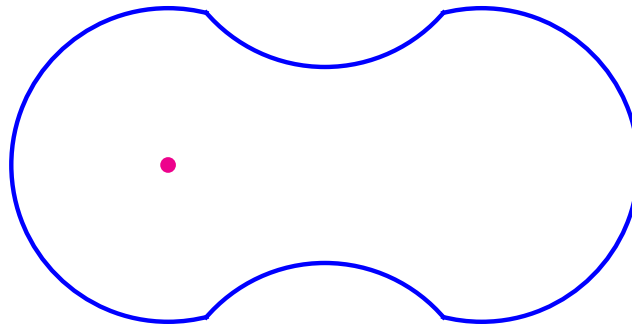
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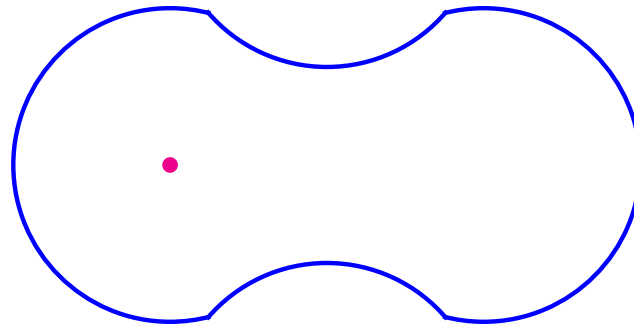
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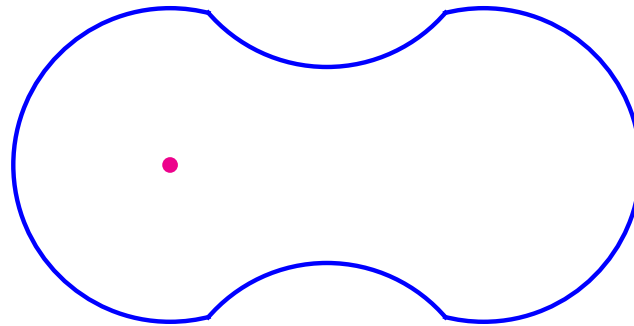
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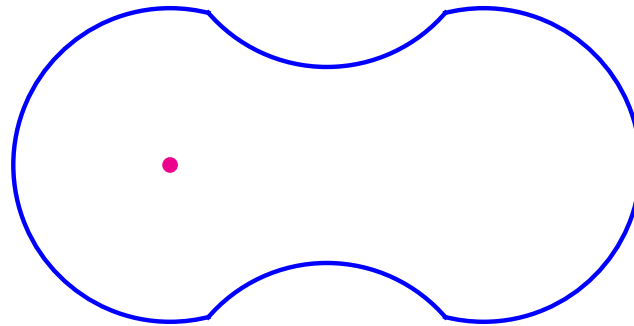


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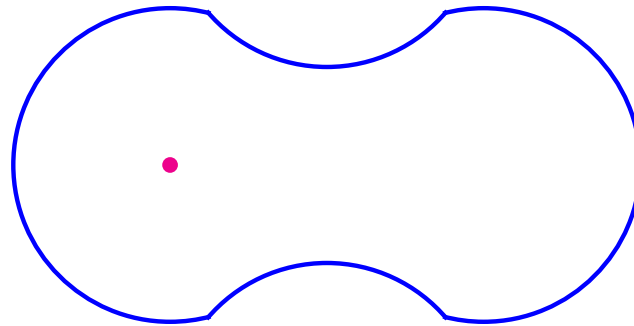
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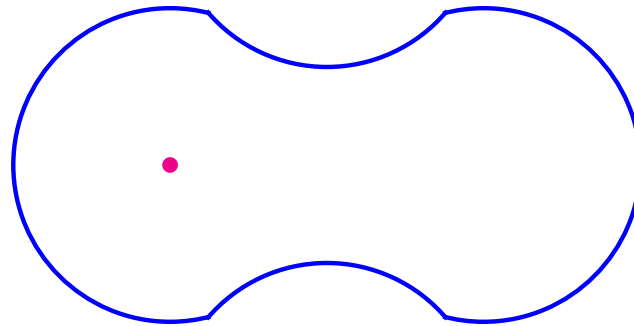
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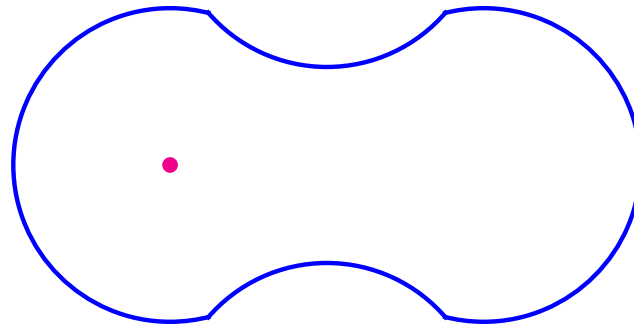
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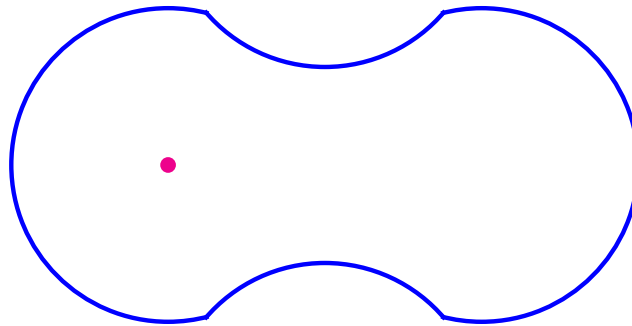
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Clockwise rotation $\Rightarrow \vec{\omega}$ is \otimes

Slowing down $\Rightarrow \vec{\alpha}$ is opposite to $\vec{\omega}$

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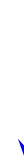
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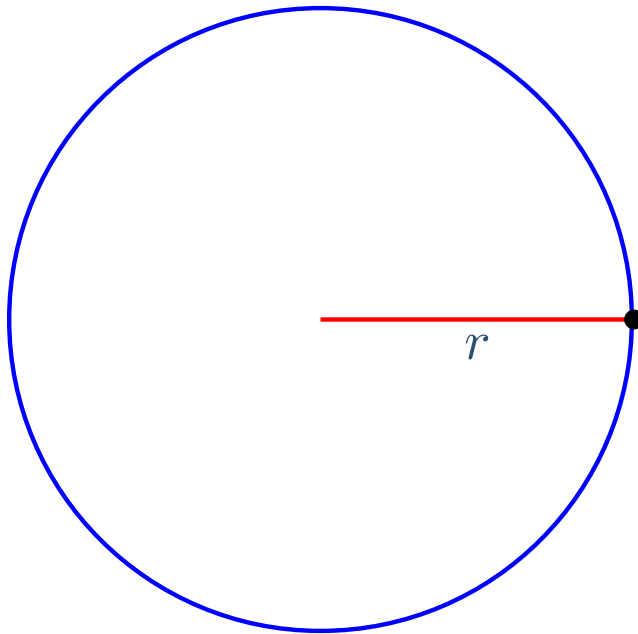
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Use the relationship $s = r\theta$ to relate linear and angular speeds.

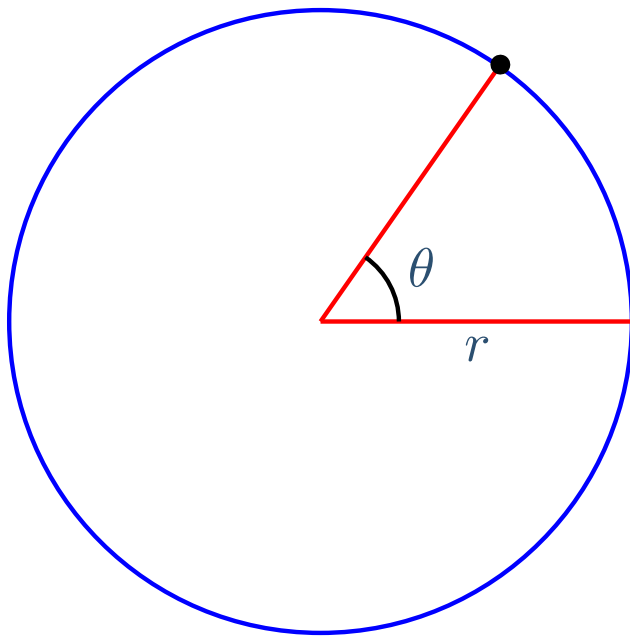
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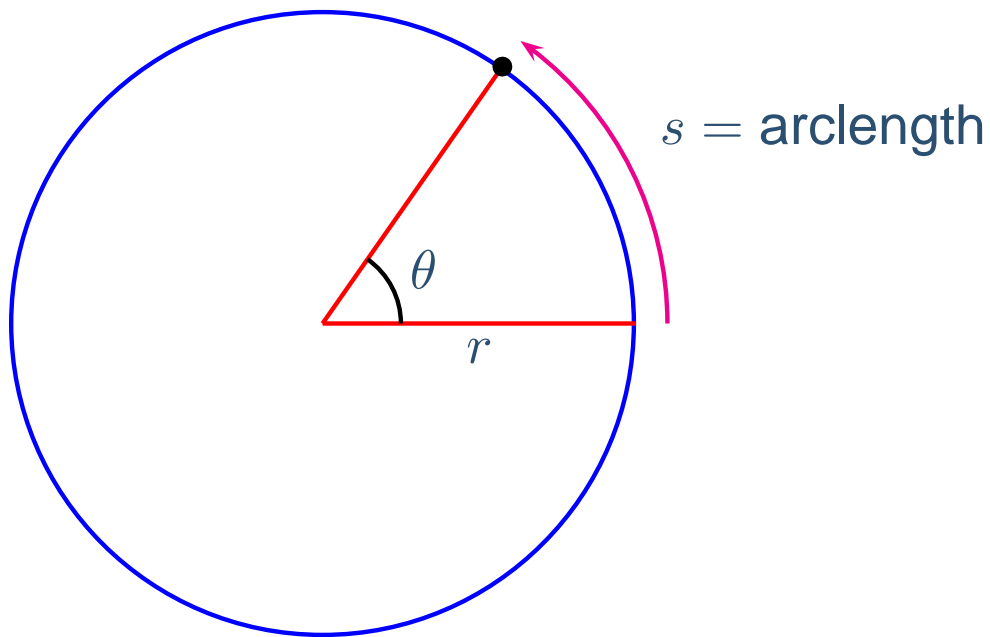
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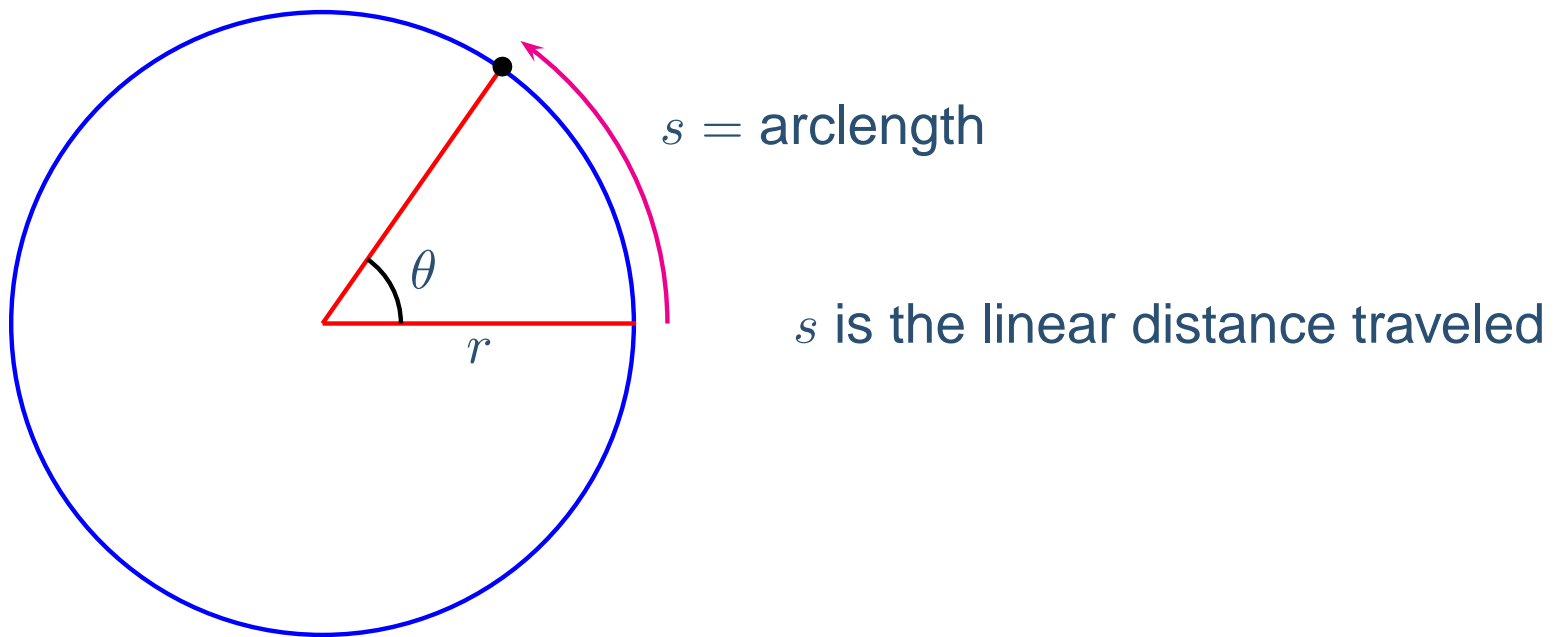
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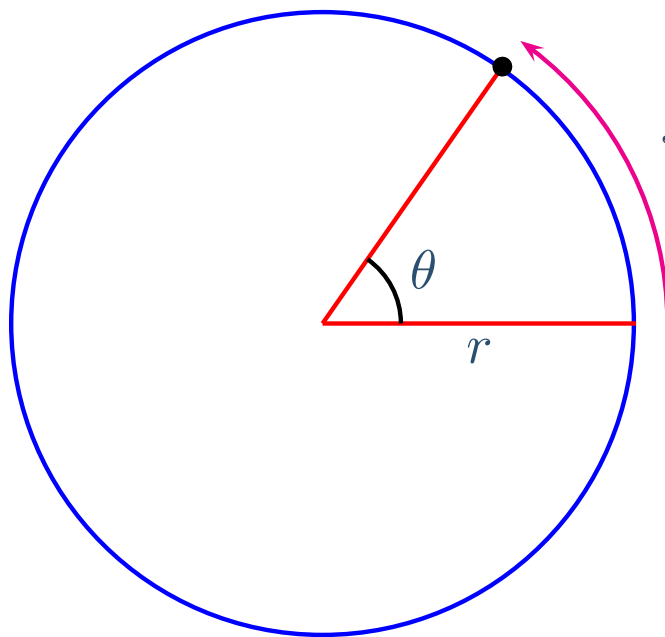
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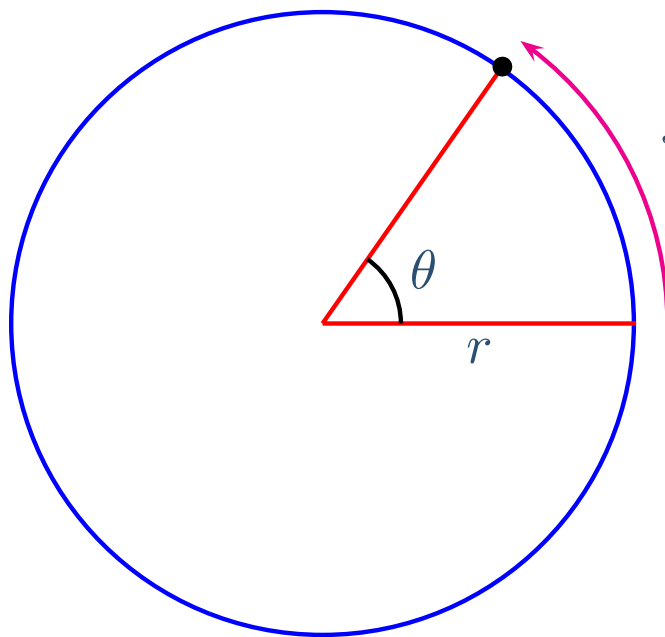
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s is the linear distance traveled

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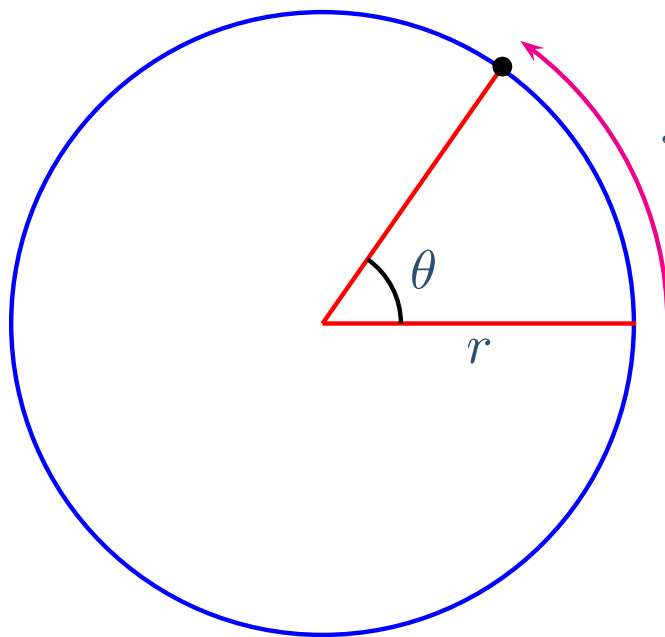
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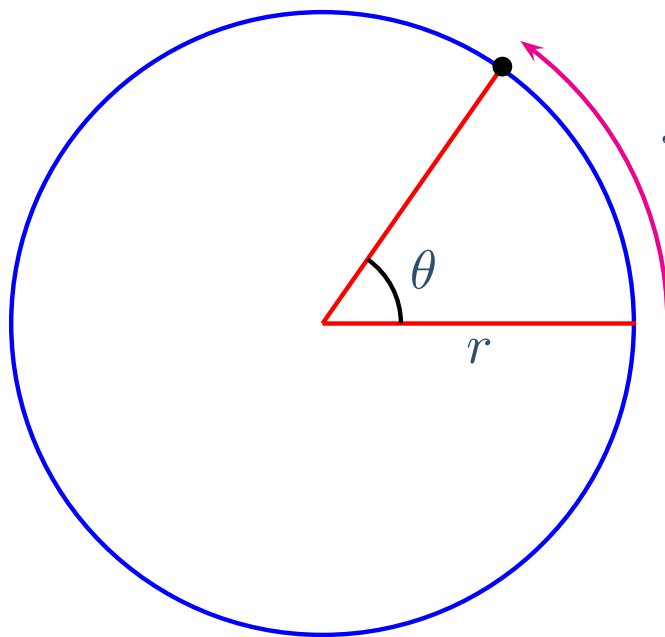
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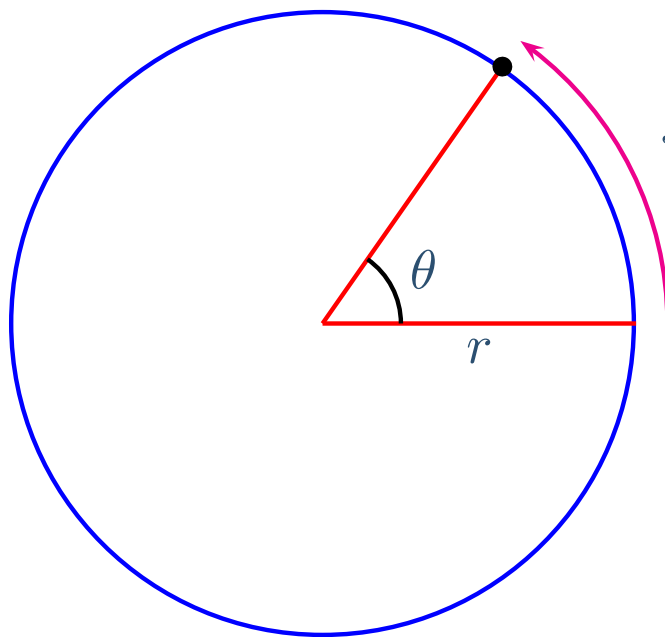
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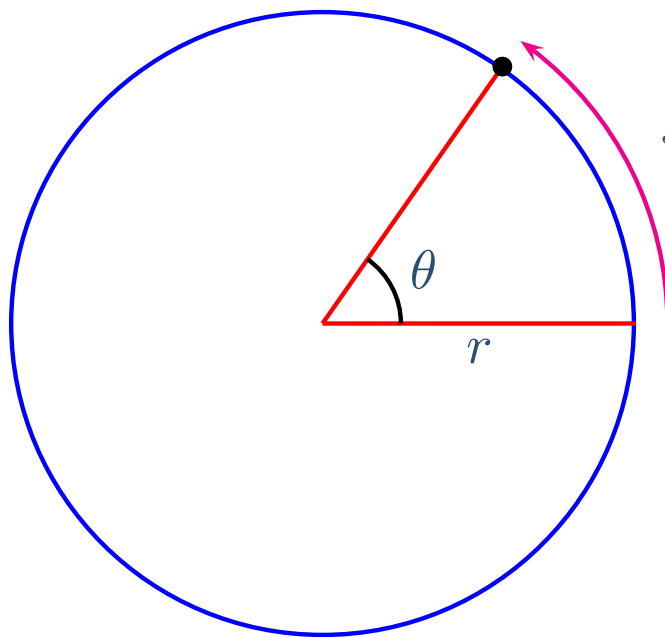
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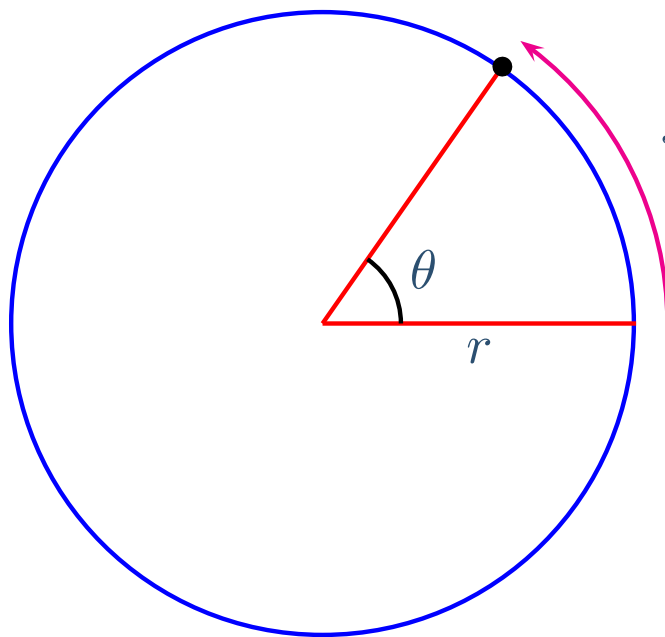
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