9.3: Relating Linear and Angular Kinematics

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The distance that a point on a rotating body moves is:

$$s = r\theta$$

where s is the distance, r is the distance from the axis of rotation, and θ is the angle in radians that the point has moved. Taking derivatives of both sides with respect to time, we get that

$$v = r\omega$$

$$a_{tan} = r\alpha$$

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To find centripetal acceleration, we have

$$a_{rad} = \frac{v^2}{r} = \omega^2 r$$