

5.2: Centripetal Force

When you're rotating at constant angular velocity, the magnitude of your velocity is always the same, but its direction constantly changes - so you're constantly undergoing an acceleration, as indicated in Equation 5.1.6. Therefore there must be a net force acting on you. We can calculate that net force using Newton's second law of motion. It is known as the centripetal force and given by:

$$\mathbf{F}_{\text{cp}} = m\mathbf{a} = -\frac{mv^2}{r}\hat{\mathbf{r}} = -m\omega^2 r\hat{\mathbf{r}} \quad (5.2.1)$$

'Centripetal' means 'center-seeking' (from Latin 'centrum' = center and 'petere' = to seek). It is important to remember that this is a net resulting force, not a 'new' force like that exerted by gravity or a compressed spring. Equation 5.2.1 is after all just a special case of Newton's second law of motion.

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