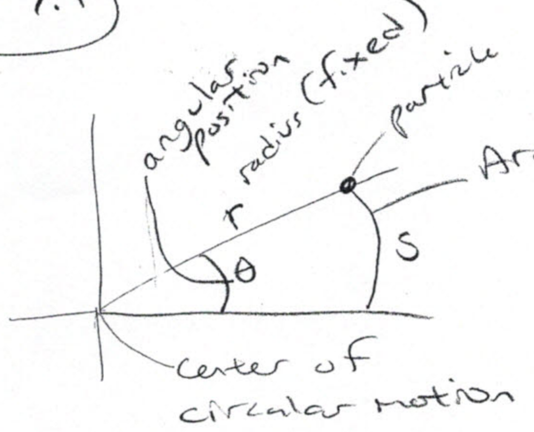
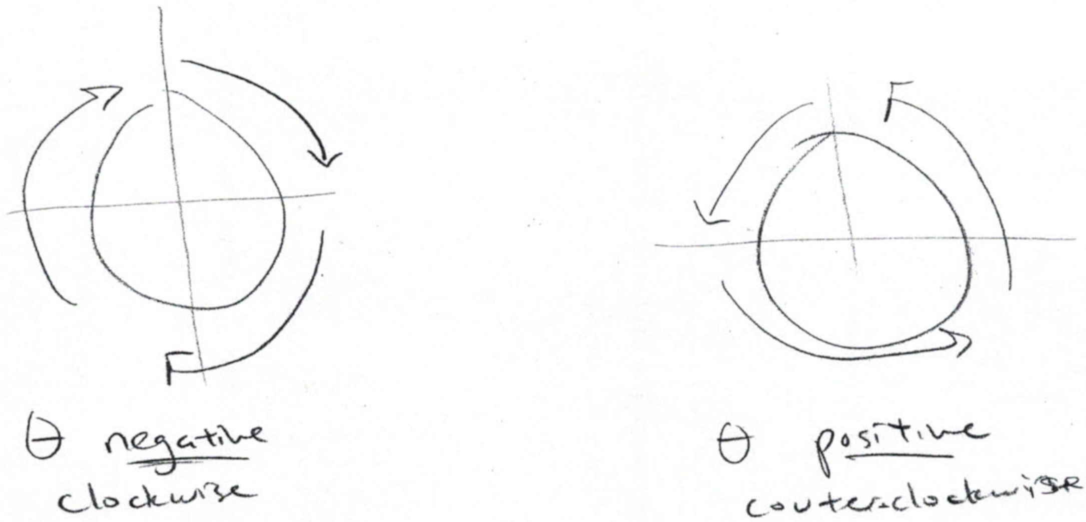
Ch. 7.1





θ angles measured in rad (radians)

$$\theta \text{ (radians)} = \frac{s \text{ (arc length)}}{r \text{ (radius of circle)}}$$

rearranged $s = r\theta$

★ not valid if θ measured in degrees

rev (revolution) = complete circle
= circle's circumference $2\pi r$

θ full circle $= \frac{s}{r} = \frac{2\pi r}{r} = 2\pi$ rad

1 rev = 360° = 2π rad

1 rad = 1 rad × $\frac{360°}{2\pi \text{ rad}}$ = 57.3°

1 rad ≈ 60°

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angular displacement

(analogy) $v_x = \frac{\Delta x}{\Delta t}$

angular velocity in uniform circular motion ← constant rate

$\omega = \frac{\Delta\theta \text{ (angular displacement)}}{\Delta t \text{ (time interval)}}$ units → $\frac{\text{rad}}{s}$

ω ← (omega)

(analogy) linear displacement $x_f - x_i = \Delta x = v_x(\Delta t)$

angular displacement for uniform circular motion $\theta_f - \theta_i = \Delta\theta = \omega(\Delta t)$

★ angular speed is absolute (direction not important)
← "ω" and used for angular velocity ← not absolute

Angular Position + Angular Velocity Graphs

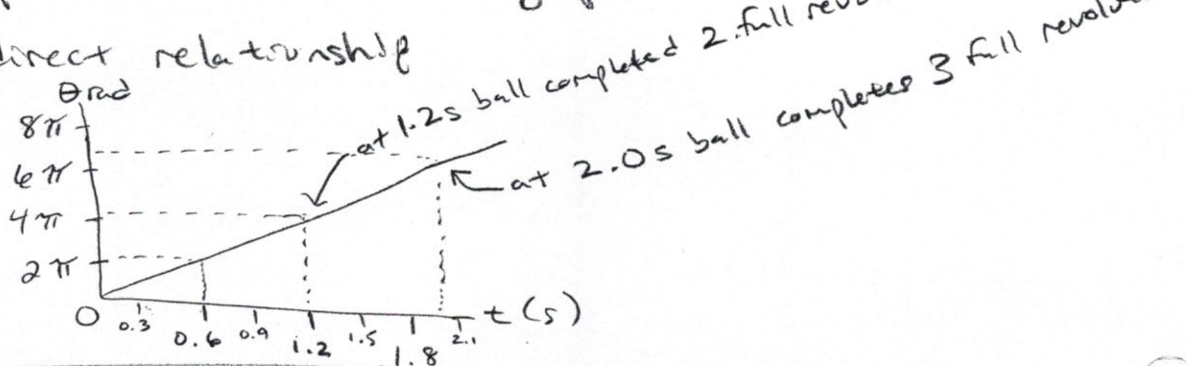
angular position of roulette ball $\omega = 10.5 \text{ rad/s}$

every second + 10.5 rad

analogy 10.5 m/s = every second car moves 10.5 meters

angular position versus time graph

☆ direct relationship



Relating Speed + Angular Speed

relate $v = 2\pi f r$

- v — speed of a particle
- f — frequency
- r — radius

relationship between speed + angular speed $v = \omega r$

ω — units rad/s