Hw #3 p 311 Problems 1, 9, 16
Online - Linear + Rotational Quantities

(5)

p311 - Problems

1) $r = 20cm = .20m$ Second hand on clock

a) $\omega = ?$ $\omega = \frac{\theta}{t} = \frac{2\pi\ rad}{60\ s} = .10\ rad/s$

(1)

b) $V_T = ?$ $V = \omega r = (.10\ rad/s)(.20m)$

$= .02\ m/s$

c) $\alpha = ?$ $\alpha = 0\ rad/s^2$ b/c constant ω

9) $r = 1.5m$ tennis racket serve

$\omega_0 = 0\ rad/s$

$V = 20\ m/s$

$t = .10s$

a) $a_T = ?$ $a = \frac{V^2}{r} = \frac{(20\ m/s)^2}{1.5m}$

$= 270\ m/s^2$

(1) $a = \frac{\Delta V}{t} = \frac{V_f - V_i}{t}$

$= \frac{20\ m/s}{.10s}$

$= 200\ m/s^2$

b) $\alpha = ?$ $\alpha = \frac{a}{r} = \frac{200\ m/s^2}{1.5m}$

$= 130\ rad/s^2$

16) $r = 2.0\,m$
$\omega_0 = 0\ rad/s$
$\alpha = .30\ rad/s^2$
$d = ?$
$V_f = 7.0\,m/s$

(1)

① $\omega = \frac{V_T}{r} = \frac{7.0\,m/s}{2.0\,m} = 3.5\ rad/s$

② $\theta = \frac{\omega^2 - \omega_0^2}{2\alpha} = \frac{(3.5\ rad/s)^2}{2(.30\ rad/s^2)}$

$= 20\ rad$

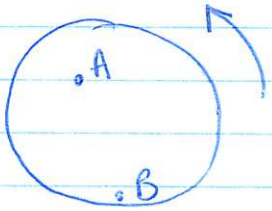
or ① $a_T = \alpha r$
② $d = \frac{V_f^2}{2a}$

③ $S = \theta r = (20\ rad)(2.0\,m) = 40\,m$

– Online Linear + Rotational Quantities Concept

merry go round – constant ω

(2)



Ana at A
Bobby at B

a) greater linear V?

$V = \frac{2\pi r}{T}$

Bobby – larger r

b) greater ω?
Same $\omega = \theta/t$

c) greater α?
Same – no ω change

c) greater a_T? tangential – constant v
Same a_T (centripetal is direction)

d) greater a_c $a_c = v^2/r$
Bobby – larger V + r