Rotational Kinematics Quiz 7.0H

1. A record player starts from rest and gets up to a "speed" of 45 rpm. This happens in 3 seconds with constant angular acceleration.
(a) Find the average angular acceleration.
(b) Find the number of revolutions made by the turntable in these 3 seconds.
(c) Find the average angular velocity over this 3 second interval.

2. A point on the edge of a circle of radius 3m completes 4 cycles in 6 seconds while turning with uniform circular motion.
(a) What is the period of revolution?
(b) What is the tangential acceleration (a_t)?
(c) What is the angular velocity (ω)?
(d) What is the magnitude of the centripetal acceleration (a_c) of the point?

3. A rolling wheel of radius 7m is turning at $5\,^{Rad}\!/_s$ when it slows to a stop with constant angular acceleration of magnitude $4\,^{Rad}\!/_{s^2}$. Assume no slipping.
(a) What is the angular distance that the wheel turns thru?
(b) What is the stopping distance of the wheel as measured along the road?
(c) What is the number of revolutions that the wheel turns thru?
(d) What is the stopping time?

4. The position of point P is given parametrically by:

Let $\omega = \dfrac{\pi}{6}\,^{Rad}\!/_s$

$$\begin{cases} x = 4\cos\omega t \\ y = 4\sin\omega t \end{cases}$$

(a) What is the constant (linear) speed of P?
(b) What is the position $(\vec{r} = (x, y))$ of P at the instant $t = 1\sec$?
(c) What is the velocity $(\vec{v} = (v_x, v_y))$ of P at the instant $t = 1\sec$?
(d) Show the dot product $\vec{r} \cdot \vec{v} = 0$ at the instant $t = 1\sec$.
(e) What is the acceleration $(\vec{a} = (a_x, a_y))$ of P at the instant $t = 1\sec$?
(f) Find the magnitude of the acceleration?

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$$\vec{r} = 4(\cos\omega t, \sin\omega t)$$
$$\vec{v} = 4\omega(-\sin\omega t, \cos\omega t)$$
$$\vec{a} = 4\omega^2(-\cos\omega t, -\sin\omega t)$$