Answer on Question #60134, Physics / Mechanics | Relativity

A particle moves along a circle of radius 'r' with constant tangential acceleration. If the velocity of the particle is 'v' at the end of second revolution, after the revolution has started then the tangential acceleration is

Solution:

Tangential acceleration:

$a_\tau = \frac{dv}{dt}$ (1),

where dv – change of speed,

dt – change of time

The period of rotation:

$T = \frac{2\pi}{\omega}$ (2),

where ω – cyclic velocity

The relationship between linear velocity v and cyclic velocity ω:

$v = \omega r$ (3),

where r – radius of the circle

Of (3) $\Rightarrow$ $\omega = \frac{v}{r}$ (4)

(4) in (2): $T = \frac{2\pi r}{v}$ (5)

$dv = v - 0 = v$ (6)

$dt = 2T$ (7)

(6) and (7) in (1):

$a_\tau = \frac{v}{2T}$ (8)

(5) in (8): $a_\tau = \frac{v^2}{4\pi r}$

Answer:

$a_\tau = \frac{v^2}{4\pi r}$