NAME DATE

SOLUTIONS

PROBLEM: AP-9

GIVEN:

A particle is moving along a circular path having a radius of 4 in. such that its position as a function of time is given by $\theta = \cos 2t$, where θ is in radians and t is in seconds. Determine the magnitude of the acceleration of the particle when $\theta = 30°$.

$\theta = 30°$
$= \frac{\pi}{6}$

REQUIRED:

$|a|$

SOLUTION:

$r = 4$ IN $\quad \dot{r} = 0 \quad \ddot{r} = 0$

$\theta = \cos 2t \quad t = 0.510$ s

$\dot{\theta} = -\sin 2t(2) = -1.70$ RAD/s

$\ddot{\theta} = -2\cos 2t(2) = -2.09$ RAD/s^2

$\theta = 30°$
$t = 0.51$ s

$a_r = -11.61$ IN/s^2

$a_\theta = -8.38$ IN/s^2

$\vec{a} = \{-11.61\,\hat{e}_r - 8.38\,e_\theta\}$ IN/s^2

$a = \sqrt{\Sigma^2} = 14.3$ IN/s^2

$\boxed{|a| = 14.3 \text{ IN/s}^2}$