

ME 222- DYNAMICS

QUIZ 2

Fall Semester 2015-2016

Name, Family Name : _____

ID # : _____ Section # : _____ Signature : _____

Date: ^{12/10} ~~23/09~~ /2016

Max. Marks: 1 x 10 = 10

Marks

10

Answer the following question.

A car travels along the circular curve of radius $r = 300$ ft. At the instant shown, its angular rate of rotation is $\dot{\theta} = 0.4$ rad/s, which is increasing at the rate of $\ddot{\theta} = 0.2$ rad/s². Determine the magnitudes of the car's

① velocity and acceleration at this instant.

$r = 300$ ft/s, $\dot{r} = 0$, $\ddot{r} = 0$, $\dot{\theta} = 0.4$ rad/s, $\ddot{\theta} = 0.2$ rad/s², $\dot{\theta}^2 = 0.16$ rad/s²

$V = \dot{r} u_r + r \dot{\theta} u_{\theta}$

$= 0 u_r + (300 \times 0.4) u_{\theta}$

$V = 0 + 120 u_{\theta} \Rightarrow |V| = \sqrt{0 + 120^2}$
 $|V| = 120$ ft/s ①

$a = (\ddot{r} - r \dot{\theta}^2) u_r + (2 \dot{r} \dot{\theta} + r \ddot{\theta}) u_{\theta}$

$a = [0 - [300 \times 0.4^2]] u_r + [(2(0) \times 0.4) + [300 \times 0.2]] u_{\theta}$

$a = -48 u_r + 60 u_{\theta} \Rightarrow |a| = \sqrt{48^2 + 60^2} = 76.84$ ft/s² ②

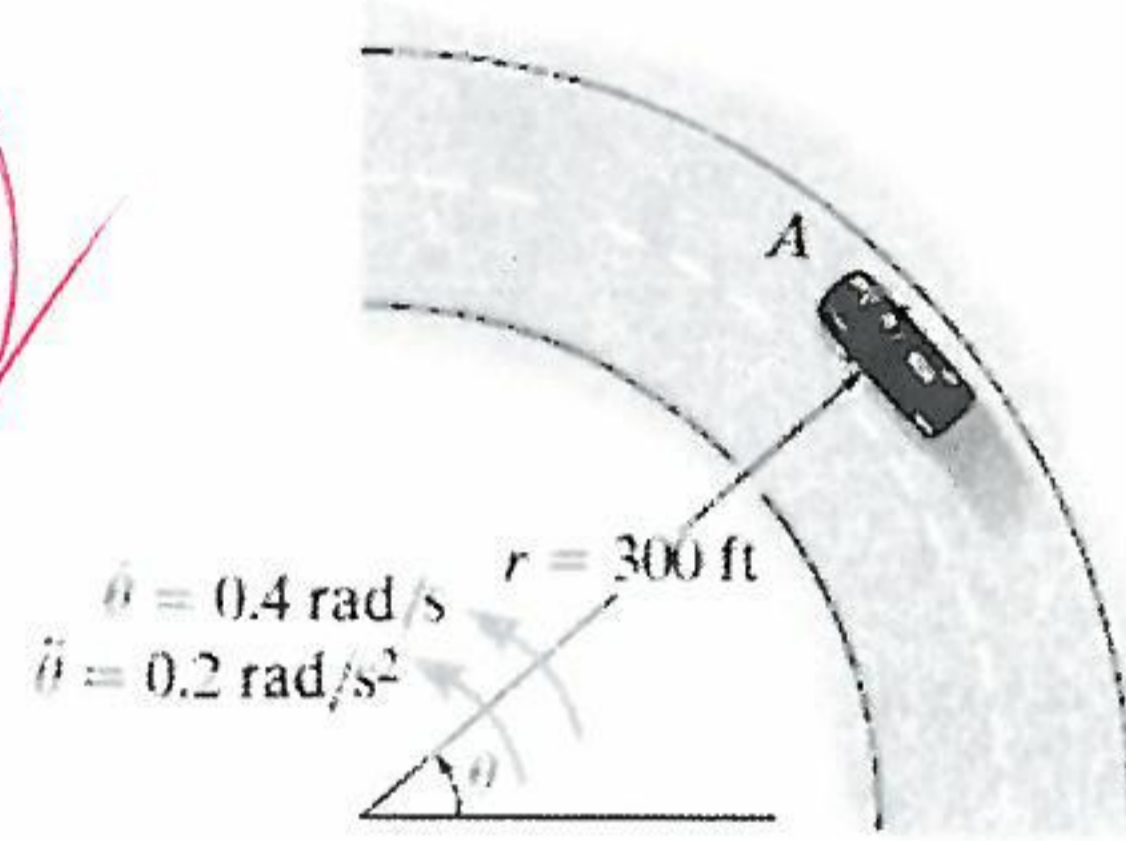


Fig. Q.1

* For Instructor use only

SO - E	An ability to identify, formulate, and solve engineering problems
CO - 1	Solve kinetic problems involving rectilinear, curvilinear and relative motion of particles.
PI_5_13	Apply basic concepts of Kinematics and kinetics to solve elementary problems