

ME214: QUIZ #2 - Fall 2021

Q1 Path description of acceleration - 1

2 Points

Consider the path description for the motion of a point P. Choose the response below that most accurately describes the acceleration of P.

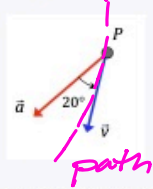
- The rate of change of speed, \dot{v} , is ALWAYS the same as the magnitude of the acceleration $|\dot{a}|$.
- The rate of change of speed, \dot{v} , is the same as the magnitude of the acceleration $|\dot{a}|$ ONLY if the path is straight.
- The acceleration is always perpendicular to the path.
- None of the above.

$$|\vec{a}| = \sqrt{\dot{v}^2 + \left(\frac{v^2}{\rho}\right)^2}$$

$$|\vec{a}| = \dot{v} \text{ if } v=0 \text{ OR } \rho = \infty$$

Q2 Path description of acceleration - 2

2 Points



- $\vec{a} \cdot \vec{v} > 0 \Rightarrow$ speeding up
- Passenger sees \vec{a} off to right \Rightarrow turning right

You are a passenger in a forward-moving automobile P. Your velocity and acceleration vectors are shown above. Choose the correct response below regarding your motion.

- You are turning left and slowing down.
- You are turning right and slowing down.
- You are turning left and speeding up.
- You are turning right and speeding up.
- More information is needed in order to answer the question.

Q3 Joint kinematics

2 Points

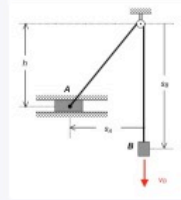
A polar description is used to calculate the velocity and acceleration of a point P, with the following results: $\vec{v} = (4\hat{e}_r - 12\hat{e}_\theta) \text{ ft/s}$ and $\vec{a} = (10\hat{e}_\theta) \text{ ft/s}^2$. Choose the correct response below.

- The speed of P is increasing.
- The speed of P is constant.
- The speed of P is decreasing.
- More information is needed in order to answer the question.

$$\vec{a} \cdot \vec{v} = (-12)(4) < 0 \Rightarrow \text{decreasing speed}$$

Q4 Constrained motion

2 Points



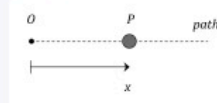
Blocks A and B are connected by a cable, with the cable being pulled over a small pulley. Analysis shows the following relationship between the speeds of A and B: $v_B = \left(\frac{s_A}{\sqrt{h^2 + s_A^2}}\right) v_A$. Choose the correct response below. Based on this equation we see that:

- $v_A > v_B$
- $v_A = v_B$
- $v_A < v_B$
- More information is needed in order to answer the question.

$$v_B = \left(\frac{s_A}{\sqrt{s_A^2 + h^2}}\right) v_A < 1 \text{ for all } s_A \Rightarrow v_B < v_A$$

Q5 Cartesian coordinates

2 Points



Particle P travels along a straight path, with the position of P on the path being described by the coordinate x. The speed of P is known in terms of the position x to be $v(x) = 5x^3$. Choose the answer below that best describes the acceleration of P in terms of x, for $x > 0$:

- $a = 5$
- $a = 0$
- $a = 5x^2$
- $a = 15x^2$
- $a = 75x^5$
- none of the above

$$a = \frac{dv}{dt} = \frac{dv}{dx} \frac{dx}{dt} = v \frac{dv}{dx} = (5x^3)(15x^2) = 75x^5$$

Q6 Word of the day

2 Points

The word of the day is:

Labor