ME 274 – Spring 2025 **Name** SOLUTION
Quiz02 – 1:30 section

Particle P travels in the *xy*-plane on a path described by a set Cartesian coordinates given by: $y = Acos(\pi bx)$, where b and A are positive constants. It is known that $\dot{x} = \frac{dx}{dt} = v$ = *negative constant* for all motion of P. *Circle* the correct responses below for the position of $x = \frac{1}{4b}$.

Question Q1.1

a) $\dot{y} > 0$
b) $\dot{y} = 0$
c) $\dot{y} < 0$
d) More information needed.

$y = A\cos(\pi bx)$
$\dot{y} = \frac{dy}{dt} = \frac{dy}{dx}\frac{dx}{dt}$
$= [-(A\pi b)\sin\pi bx]\,\dot{x}$
> 0

Question Q1.2

a) $\ddot{y} > 0$
b) $\ddot{y} = 0$
c) $\ddot{y} < 0$
d) More information needed.

$\ddot{y} = \frac{d}{dt}(\dot{y})$
$= [-A(\pi b)^2\cos\pi bx]\,\dot{x}^2 - [(A\pi b)\sin\pi bx]\,\ddot{x}$
< 0

Problem Q2.1

Particle P travels along a path in the *xy*-plane. At the position shown, the velocity and acceleration of P are provided, with magnitudes of $40\ ft/s$ and $10\ ft/s^2$, respectively, and $\theta = 36.87°$. For this position, write down expressions for the velocity and acceleration of P in terms of their Cartesian components using the unit vectors $\hat{\imath}$ and $\hat{\jmath}$.

Problem Q2.2 - BONUS

Is the speed of P *increasing*, *decreasing* or *constant*?

$\vec{v} = v(\cos\theta\,\hat{\imath} - \sin\theta\,\hat{\jmath})$
$= 40(0.8\hat{\imath} - 0.6\hat{\jmath})$
$= (32\hat{\imath} - 24\hat{\jmath})\ ft/s$
$\vec{a} = a\hat{\jmath} = (10\hat{\jmath})\ ft/s^2$
$\dot{v} = -a\sin\theta = -(10)(0.6)$
$= -6\ ft/s^2 < 0 \Rightarrow$ decreasing speed