Q5.1.a:

What objects exert significant forces on the red block?

1) Earth, String 1, String 2
2) Earth, String 1, String 2, Hand
3) Earth, String 1, String 2, Hand, Ceiling
4) Earth, Hand, Ceiling
Q5.2.a:

Here is an incomplete force diagram for the system of the red block.

To complete it we need to draw the force due to String 1. Which arrow best indicates the direction of this force?
What is the unit vector in the direction of the force $\vec{F}_1$?

1) $\langle \cos \theta, \cos(90+\theta), 0 \rangle$
2) $\langle \cos \theta, \cos(90-\theta), 0 \rangle$
3) $\langle \cos(90+\theta), \cos(\theta), 0 \rangle$
4) $\langle \cos(90-\theta), \cos(\theta), 0 \rangle$

$F_1$ and $F_2$ are magnitudes of forces.
Q5.2.c: x component: \( \frac{dx}{dt} = F_{\text{net}_x} \)

\( F_1 \) and \( F_2 \) are magnitudes of forces.

Which equation correctly states that \( \frac{dx}{dt} = F_{\text{net}_x} \)?

1) \( 0 = -F_1\cos(\theta) + F_2 \)

2) \( 0 = F_1 - F_2 \)

3) \( 0 = F_1 + F_2 - mg \)

4) \( 0 = F_1\cos(90 + \theta) + F_2 \)
Q5.2.d: y component: \( \frac{dy}{dt} = F_{\text{net}_y} \)

\( F_1 \) and \( F_2 \) are magnitudes of forces.
Which equation correctly states that \( \frac{dy}{dt} = F_{\text{net}_y} \)?

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<td>1)</td>
<td>( 0 = F_1 - mg )</td>
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<td>2)</td>
<td>( 0 = F_1 + F_2 - mg )</td>
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<tr>
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Q5.3.a

A ball hangs from the bottom of a vertical spring. You pull the ball downwards and release it, and the ball oscillates up and down.

At the **bottom of each oscillation**, where the ball’s instantaneous momentum is zero, what is the direction of \( \frac{dp}{dt} \)?

1) 
2) 
3) zero magnitude (no direction)
A ball hangs from the bottom of a vertical spring. You pull the ball downwards and release it, and the ball oscillates up and down. At the bottom of each oscillation, where the ball’s instantaneous momentum is zero, what is the direction of $\vec{F}_{\text{net}}$?

1) Up
2) Down
3) Zero magnitude (no direction)
Q5.3.c:
Which of the red arrows labeled 1, 2, or 3 represents the vector $\Delta \vec{p}$, the change in the momentum of the comet?
Q5.3.d:

The red arrow shows the rate of change of the comet's momentum when it is at location 2.

At this instant, which components of $\frac{d\vec{p}}{dt}$ are zero?

1) The parallel component
2) The perpendicular component
3) Both the parallel and perpendicular components
4) Neither component
answer
Q5.3.e: Which of the following statements is true?

1) If $\vec{p} = \vec{0}$ then we know that $d\vec{p}/dt = \vec{0}$

2) If $\vec{p} = \vec{0}$ then $d\vec{p}/dt$ could be either zero or nonzero

3) If $d\vec{p}/dt = \vec{0}$ then we know that $\vec{p} = \vec{0}$
Q5.4.a: The Moon travels in a nearly circular orbit around the Earth, at nearly constant speed.

When the Moon is at location A, which components of $\frac{d\vec{p}}{dt}$ are zero?

1) The parallel component
2) The perpendicular component
3) Both the parallel and perpendicular components
4) Neither component
Q5.4.b: The Moon travels in a nearly circular orbit around the Earth, at nearly constant speed. When the Moon is at location A, what is the direction of $\vec{d}p/dt$?
Q5.6.a: Tarzan swings from a vine.

At the bottom of the swing, what is the direction of his $\vec{dP}/dt$?
Q5.6.b: Tarzan swings from a vine. At the bottom of the swing, which components of $d\vec{p}/dt$ are zero??

1) The parallel component
2) The perpendicular component
3) Both the parallel and perpendicular components
4) Neither component
Q5.6.c: Tarzan swings from a vine. At the bottom of the swing, what is the direction of the net force acting on Tarzan?
Q5.6.d: Tarzan swings from a vine. At the bottom of the swing, what objects exert forces on Tarzan (neglecting air resistance)?

1) Earth, vine
2) centrifugal force only
3) Earth and centrifugal force
4) Earth, vine, centrifugal force
Q5.6.e: At the bottom of the swing, how does the magnitude of the force on Tarzan by the vine compare to the magnitude of the force on Tarzan by the Earth?

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<tr>
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<th>$F_{\text{vine}} &gt; F_{\text{Earth}}$</th>
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<tbody>
<tr>
<td>2</td>
<td>$F_{\text{vine}} = F_{\text{Earth}}$</td>
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<tr>
<td>3</td>
<td>$F_{\text{vine}} &lt; F_{\text{Earth}}$</td>
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<td>4</td>
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Q5.6.f: Tarzan’s mass: 100 kg. Length of vine: 5 m. Tarzan’s speed: 13 m/s. What is the tension in the vine at this instant?

1) 980 N
2) 3380 N
3) 2400 N
4) 4360 N