This print-out should have 12 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

**Cartesian Coordinates**

001 (part 1 of 2) 10.0 points
Two points have cartesian coordinates $(6.7 \text{ m}, -10 \text{ m})$ and $(-10 \text{ m}, 9.7 \text{ m})$.
Find the distance between these points.
Correct answer: 25.826 m.

002 (part 2 of 2) 10.0 points
What is the angle between the line connecting the two points and the $x$-axis (measured counter-clockwise from the $x$-axis and within the limits of $-180^\circ$ to $+180^\circ$)?
Correct answer: 130.288°.

**Distance to the Origin**

003 (part 1 of 2) 10.0 points
The cartesian coordinates of a point in the $xy$ plane are $x = -6.08 \text{ m}, y = -6.39 \text{ m}$.
Find the distance $r$ from the point to the origin.
Correct answer: 8.82035 m.

004 (part 2 of 2) 10.0 points
Calculate the angle $\theta$ between the radius-vector of the point and the positive $x$ axis (measured counterclockwise from the positive $x$ axis, within the limits of $-180^\circ$ to $+180^\circ$).
Correct answer: $-133.576^\circ$.

**Vector Components 02**

005 (part 1 of 2) 10.0 points
A vector representing $140 \text{ N}$ is oriented at $35^\circ$ with the horizontal.
What is the magnitude of its horizontal component?
Correct answer: 114.681 N.

006 (part 2 of 2) 10.0 points
What is the magnitude of its vertical component?
Correct answer: 80.3007 N.

**Descent Vehicle**

007 (part 1 of 2) 10.0 points
A descent vehicle landing on the moon has a vertical velocity toward the surface of the moon of $27.8 \text{ m/s}$. At the same time, it has a horizontal velocity of $53.8 \text{ m/s}$.
At what speed does the vehicle move along its descent path?
Correct answer: 60.5581 m/s.

008 (part 2 of 2) 10.0 points
At what angle with the vertical is its path?
Correct answer: 62.6733°.

**Vector Addition 02**

009 (part 1 of 2) 10.0 points
Two vectors $\mathbf{A}$ and $\mathbf{B}$, are lying in the $xy$ plane and given by

\[ \mathbf{A} = A_x \mathbf{i} + A_y \mathbf{j} \]
\[ \mathbf{B} = B_x \mathbf{i} + B_y \mathbf{j}. \]

where $A_x = 4.31 \text{ m}, A_y = 0.162 \text{ m}, B_x = 3.88 \text{ m}, B_y = -4.22 \text{ m}$. Let $\mathbf{R} = \mathbf{A} + \mathbf{B}$.
Find the magnitude of $\mathbf{R}$.
Correct answer: 9.14021 m.

010 (part 2 of 2) 10.0 points
Find the angle $\theta$ that the vector $\mathbf{R}$ makes from the positive $x$ axis. Choose your answer to be between $-180^\circ$ and $+180^\circ$. The positive angular direction is counter clockwise measured from the $x$ axis.
Correct answer: $-26.3576^\circ$.

**Scalar Product 02**

011 (part 1 of 2) 10.0 points
The vectors $\tilde{\mathbf{A}}$ and $\tilde{\mathbf{B}}$ are given by

\[ \tilde{\mathbf{A}} = 4.76 \hat{i} + 3.74 \hat{j} \]
\[ \tilde{\mathbf{B}} = -1.59 \hat{i} + 4.61 \hat{j} \]
Find the scalar product $\vec{A} \cdot \vec{B}$.

Correct answer: 9.673.

Find the angle between $\vec{A}$ and $\vec{B}$.

Correct answer: 70.8722°.