SECOND MIDTERM

Name (print) __________________________ Name (signed) __________________________

Discussion Instructor (circle one): Hamed Hari Molina Nott Paul Reeve Zhang

Discussion Section # ________

SHOW ALL WORK!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES:
Use the conversion constants and data given on the front page.

On the moon, a rock is thrown up a hill that is inclined at 16.0° to the horizontal. The rock lands 525 meters up the hill.

(a) Find the initial velocity.
(b) Calculate the magnitude and direction of the velocity when the rock lands. (Express the angle using a labeled drawing.)

\[
V_o \cos 46^\circ t = 525 \text{ m} \\
V_o \sin 46^\circ t - \frac{1}{2} g t^2 = 525 \sin 16^\circ
\]

\[
t = \frac{525 \cos 16^\circ}{V_o \cos 46^\circ}
\]

\[
\Rightarrow 525 \cos 16^\circ \tan 46^\circ - \frac{1}{2} g \left( \frac{525 \cos 16^\circ}{\cos 46^\circ} \right)^2 \frac{1}{V_o^2} = 525 \sin 16^\circ
\]

\[
\Rightarrow V_o = 34.2 \text{ m/sec.}
\]

b) \[
t = \frac{525 \cos 16^\circ}{V_o \cos 46^\circ} = 21.3 \text{ sec.}
\]

\[
\Rightarrow V_y = V_y - g t = V_o \sin 46^\circ - 1.67 \text{ m/s}^2 t
\]

\[
= -10.9 \text{ m/sec.}
\]

\[
V_x = V_x = 23.8 \text{ m/sec.}
\]

\[
|V| = \sqrt{V_x^2 + V_y^2} = 26.1 \text{ m/sec.}
\]

\[
\Theta = -24.7^\circ
\]