Physics 3A: Basic Physics I  
Quiz #3b: Solution

Name: XXXXXXXXXXXXXXXXXXXXXXXXXXXX
Student ID #: ___________________________
Discussion Section: _____________________
Date: _____________________________
Signature: ____________________________

\[ v_x = v_i \cos(\theta) = \text{constant} \quad v_y = v_i \sin(\theta) - gt \quad x_f = x_i + v_i \cos(\theta) t \]
\[ y_f = y_i + v_i \cos(\theta) t - \frac{1}{2} gt^2 \quad a_x = \frac{d[v_x]}{dt} = \frac{d[v_i \cos(\theta)]}{dt} \quad a_y = (\tan(\theta)) x_f - (\frac{g}{2v_i^2 \cos^2(\theta)}) x_f^2 \]
\[ T = \frac{2\pi r}{v} \quad h = \frac{v_i^2 \sin^2(\theta)}{2g} \quad R = \frac{v_i^2 \sin(2\theta)}{g} \]
\[ a_x = -a_c = -\frac{v^2}{r} \quad \vec{v}_{PO} = \vec{v}_{PO} = \vec{v}_{OO'} \]
\[ g = 9.80 \text{ m/s}^2 \]

(circle the letter of your answer)

1. (2 pts) A cannon ball is shot from a cannon at an angle of 60\(^o\). The ball's acceleration is parallel to its velocity when

a.) Just before the ball strikes the ground
b.) Just after the ball leaves the cannon
c.) At the top of the ball's trajectory
d.) Not enough information to tell

**e.) None of the above**

2. (2 pts) In the year 2101, the National Football League has expanded to include teams on the moon (\( g_{\text{moon}} = 1.6 \text{ m/s}^2 \)). A punter on earth kicks a football with the same velocity as a punter kicks a football on the moon. From this you can say

a.) earth ball goes higher and farther horizontally
b.) **moon ball goes higher and farther horizontally**
c.) earth ball goes higher and the moon ball goes farther horizontally
d.) earth ball goes farther horizontally and the moon ball goes higher
e.) Both earth and moon balls go the same height and distance horizontally

3. (6 pts) You are pilot of a bomber, flying horizontally over level ground with a speed of 350 m/s relative to the ground, with an altitude of 2500 m. You release one bomb. a.) How far will the bomb travel horizontally between its release and impact on the ground? b.) You release another bomb 35 s later. How far apart will the impacts be on the ground (i.e. distance between them on the ground) Assume your plane keeps a constant velocity. (use back of sheet as well, circle your final answer and show all work)
a.) Look at x-direction: 
\[ x_f = x_i + v_i \cos(\theta_i) t = 0 + v_i \cos(0) t = v_i t \], so we need \( t \).

use y-direction to get \( t \): 
\[ y_f = y_i - v_i \sin(\theta_i) t - \frac{1}{2} g t^2 = y_i + 0 - \frac{1}{2} g t^2 \]
solve for \( t \):
\[ t = \sqrt{\frac{2 y_i}{g}} = \sqrt{\frac{2(2500)}{9.80}} = 22.6 \text{s} \]
and use this in x-direction:
\[ x_f = (350.)(22.6) = 7910 \text{ m} \]

b.) that's just the distance traveled by the bomber (plane) during the 35 s interval:
\[ \Delta x = v t = (350.)(35) = 12250. \text{ m} = 12000 \text{ m (sig. fig.)} \]