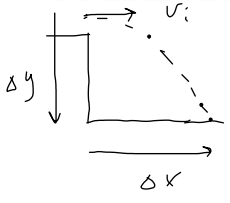
Honors Physics Test - Ch. 3 - practice

Name WARD ____°

1. A car is driven horizontally off a 40 m high cliff at 24 m/s. How far from the base of the cliff does it hit?



$v_i = 24 \frac{m}{s}$
$\Delta y = -40m$
$a = -9.8 \frac{m}{s^2}$
$\Delta x = \_\_ m$
$v_{iy} = 0 \frac{m}{s}$

$\Delta y = v_{iy} t + \frac{1}{2} a t^2$

$t = \sqrt{\frac{2\Delta y}{a}}$

$= \sqrt{\frac{2(-40m)}{-9.8 \frac{m}{s^2}}}$

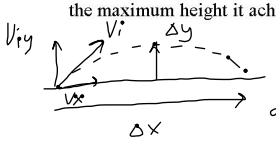
$t = 2.86 s$

$\Delta x = v_x t$

$= 24 \frac{m}{s} (2.86 \frac{m}{s})$

$\Delta x = 68.6 m$

2. A football is kicked from ground level at 22 m/s at a 52° angle from the ground. (a) Find the x and y components of its velocity (b) Find its hang time (c) find how far away it hits the ground without using the range equation (d) find the maximum height it achieves.



$v_i = 22 \frac{m}{s}$
$\theta = 52°$
$v_x = \_\_ \frac{m}{s}$
$v_{iy} = \_\_ \frac{m}{s}$
$a = -9.8 \frac{m}{s^2}$
$\Delta t = \_\_ s$
$\Delta x = \_\_ m$
$\Delta y_m = \_\_ m$

$v_x = v_i \cos\theta$

$= 22 \frac{m}{s} \cos 52°$

a) $v_x = 13.5 \frac{m}{s}$

$v_{iy} = v_i \sin\theta$

$= 22 \frac{m}{s} \sin 52°$

$v_{iy} = 17.3 \frac{m}{s}$

$\Delta y = v_{iy} t + \frac{1}{2} a t^2$

$t = -\frac{2 v_{iy}}{a}$

$= -\frac{2(17.3 \frac{m}{s})}{-9.8 \frac{m}{s^2}}$

b) $t = 3.53 s$

$\Delta x = v_x t$

$= 13.5 \frac{m}{s} (3.53 s)$

c) $\Delta x = 47.7 m$

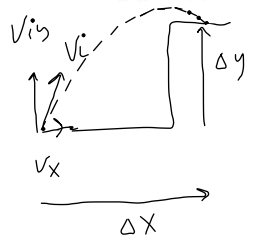
$\Delta y_m = v_{iy} t + \frac{1}{2} a t^2$

$t_h = 1.77 s$

$\Delta y = 17.3 \frac{m}{s} (1.77 s) + \frac{1}{2} (-9.8 \frac{m}{s^2}) (1.77 s)^2$

d) $\Delta y_m = 15.3 m$

3. An artillery shell is fired from a valley up onto a 300 m high cliff. If it leaves the gun at ground level at 650 m/s at a 72° angle, find (a) its hang time (b) how far away is it along the x-axis it hits the cliff.



$\Delta y = 300m$
$a_y = -9.8 \frac{m}{s^2}$
$\Delta x = \_\_ m$
$v_i = 650 \frac{m}{s}$
$\theta = 72°$

$v_x = v_i \cos\theta$

$= 650 \frac{m}{s} \cos 72°$

$v_x = 201 \frac{m}{s}$

$v_{iy} = v_i \sin\theta$

$= 650 \frac{m}{s} \sin 72°$

$v_{iy} = 618 \frac{m}{s}$

$v_{fy}^2 = v_{iy}^2 + 2a\Delta y$

$v_{fy} = \sqrt{(618 \frac{m}{s})^2 + 2(-9.8 \frac{m}{s^2})(300m)}$

$v_{fy} = -608 \frac{m}{s}$

$v_{fy} = v_{iy} + at$

$t = \frac{v_{fy} - v_{iy}}{a}$

$= \frac{-608 \frac{m}{s} - 618 \frac{m}{s}}{-9.8 \frac{m}{s^2}}$

a) $t = 125 s$

$\Delta x = v_x t$

$= 201 \frac{m}{s} (125 s)$

b) $\Delta x = 25100 m$