P11 - 2.4 - Ball Throw Up from Ground Notes

h vs t

$v_f = 0$; Max Height

$d = ? = 5.1$

$v_i = 10\dfrac{m}{s}$

$a = g = -9.8\dfrac{m}{s^2}$
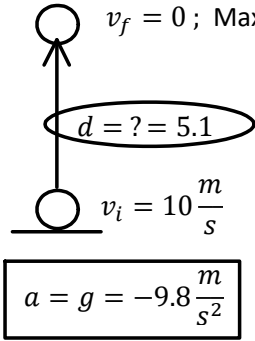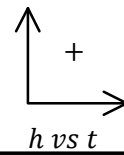
$v_f^2 = v_i^2 + 2ad$
$0^2 = 10^2 + 2(-9.8)d$
$0 = 100 - 19.6d$
$19.6d = 100$
$d = 5.1m$ **Up**

Max Height $= 5.1m$
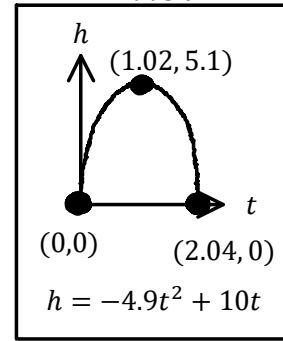
$v_f^2 = v_i^2 + 2ad$
$0 = v_i^2 + 2ad$
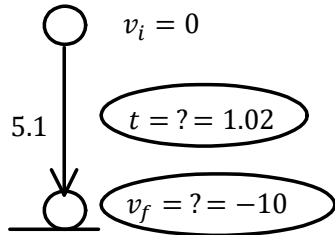$d = \dfrac{-v_i^2}{2a}$
$d = \dfrac{-10^2}{2(-9.8)}$
$d = 5.1m$

To find time, Drop it from Max Height, $v_i = 0$

$(1.02, 5.1)$

$(0,0)$ $(2.04, 0)$

$h = -4.9t^2 + 10t$

$v_i = 0$

5.1

$t = ? = 1.02$

$v_f = ? = -10$

Symmetry

$v_f = v_i$
$v_f = 10\dfrac{m}{s}$

$\Delta d = v_i t + \dfrac{1}{2}at^2$
$-5.1 = 0 \times t + \dfrac{1}{2}(-9.8)t^2$
$-5.1 = -4.9t^2$
$1.04 = t^2$
$t = 1.02s$ **Down**

Time to Max Height $= 1.02s$

Velocity Before Impact $= -10\dfrac{m}{s}$

$\Delta d = v_i t + \dfrac{1}{2}at^2$
$\Delta d = \dfrac{1}{2}at^2$
$t = \sqrt{\dfrac{2d}{a}}$
$t = \sqrt{\dfrac{2(-5.1)}{-9.8}}$
$t = 1.02s$

$\Delta d = d_f - d_i$
$\Delta d = 0 - 5.1$
$\Delta d = -5.1m$

Double Time

$t_{total} = 1.02 \times 2$
$t_T = 2.04s$

Total Time $= 2.04s$

OR   **Double Time**

Up/Down

$v_f = 0$; Max Height

$t = ? = 1.02$

$d = ? = 5.1$

$v_i = 10\dfrac{m}{s}$

$a = g = -9.8\dfrac{m}{s^2}$
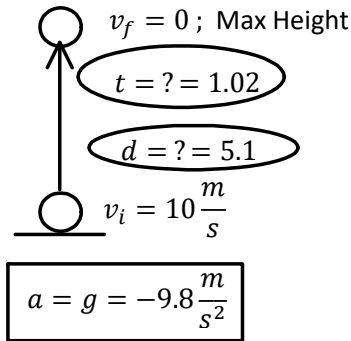
$v_f = v_i + at$
$0 = 10 + (-9.8)t$
$t = 1.02s$

Time to Max Height $= 1.02s$

$v_f = v_i + at$
$0 = v_i + at$
$t = \dfrac{-v_i}{a}$
$t = \dfrac{-10}{-9.8}$
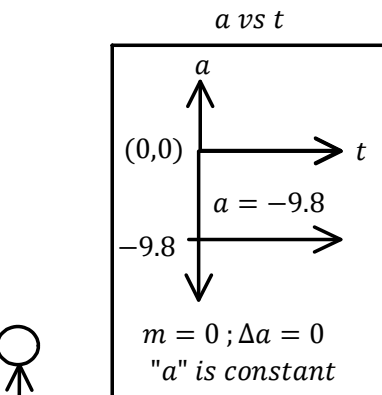$t = 1.02s$

v vs t

$v = 10 - 9.8t$

10

$(0,0)$ t

$(2.04, -10)$

$m = a = -9.8$
Obviously!
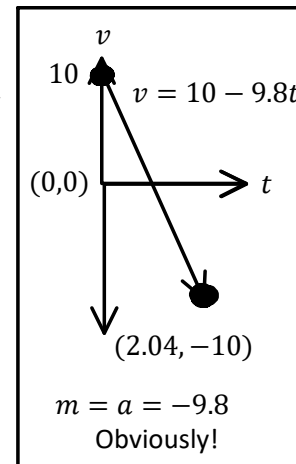
$\Delta d = v_i t + \dfrac{1}{2}at^2$
$d = 10(1.02) + \dfrac{1}{2}(-9.8)(1.02)^2$
$d = 5.1m$ **Up**

Max Height $= 5.1m$

a vs t

$(0,0)$ t

$a = -9.8$

-9.8

$m = 0 ; \Delta a = 0$
"a" is constant

$\Delta d = v_i t + \dfrac{1}{2}at^2$
$0 = 10t + \dfrac{1}{2}(-9.8)t^2$
$0 = -10t - 4.9t^2$
$0 = -4.9t(t - 2.04)$

$\Delta d = 0$ **Up/Down**

$-4.9t = 0$
$t = 0s$ $t - 2.04 = 0$
$t = 2.04s$

Or Quadform

$t = ? = 2.04$

$v_i = 10$

Total Time $= 2.04s$