PHYSICS 1408 LAMP

CHAPTER 2 NOTES

VERTICAL ACCELERATION (dropping things)

>Variables:

Acceleration of gravity: $g = 9.8\ m/s^2$

Acceleration in the vertical direction: A_y

$A_y = -g$

>Examples:

1. A person drops a ball off the side of a 1000 m tall building. What is the velocity of the ball right before impact with the ground?

Given: $h = 1000\ m$ Solving For: V_{yf}

$A_y = -g$

$g = 9.8\ m/s^2$

$V_{yi} = 0\ m/s$ *since the ball is dropped, it has no initial velocity

$Y_i = h$

$Y_f = 0$

The kinematics equation needed:

$V_f^2 = V_i^2 + 2a_y(\Delta y)$ Plug and Chug...

$V_f^2 = (0\ m/s) + 2(-9.8\ m/s^2)(-1000\ m)$

$V_f^2 = 19600\ m^2/s^2$

$V_f = 140\ m/s$ *since the ball is moving in the negative direction, we interpret the velocity as negative too

The ball is moving at a velocity of -140 m/s the instant before it hits the ground.

2. A ball is thrown directly upward with an initial velocity of 20 m/s. It reaches a certain height, 'h', and the falls down to its initial position. What is h?

Given: $V_{yi} = 20\ m/s$ Solving For = h

$V_{yo} = 0\ m/s$ *the subscript 'o' represents the peak point of the ball, we will use this as V_{yf}

$A_y = -g$

$g = 9.8\ m/s^2$

$y_i = 0m$

$y_f = h$

The kinematics equation needed:

$V_{yf}^2 = V_{yi}^2 + 2a_y(\Delta y)$ Plug givens...

$(0\ m/s)^2 = (20\ m/s)^2 + 2(-9.8\ m/s^2)(h)$

$0\ m^2/s^2 = 400\ m^2/s^2 + (-19.6\ m/s^2)h$

$-400\ m^2/s^2 = (-19.6\ m/s^2)h$

$20.4\ m = h$

The ball reaches a maximum height of 20.4 meters.