Key

**Quiz 2 – PH241** **Name**_____ ☐ **Pledged**

**For full credit draw a picture with coordinate system.**

(A) A rock falls from a cliff that is 56 meters above the water. It falls directly into a boat which is moving with constant velocity towards the cliff. The boat was 15 meters from the point of impact when the rock was released. What is the speed of the boat?

(B) Assume now that the boat stays still and is 15 meters away. How fast horizontally must you throw the rock from the cliff to hit the boat?

(C) Sketch a $v$ vs. $t$ graph for the rock and the boat in part (A)

In general for linear motion assuming constant acceleration:
$v_x = v_{0x} + a_x t$ $\Delta x = v_{0x} t + \frac{1}{2} a_x t^2$ $v_x{}^2 = v_{0x}{}^2 + 2 a_x \Delta x$
$v_{ave} = \frac{v_x + v_{0x}}{2}$

A) $\Delta X = 15m$

$\Delta y = +56m$ $g = +9.8 m/s^2 = a$

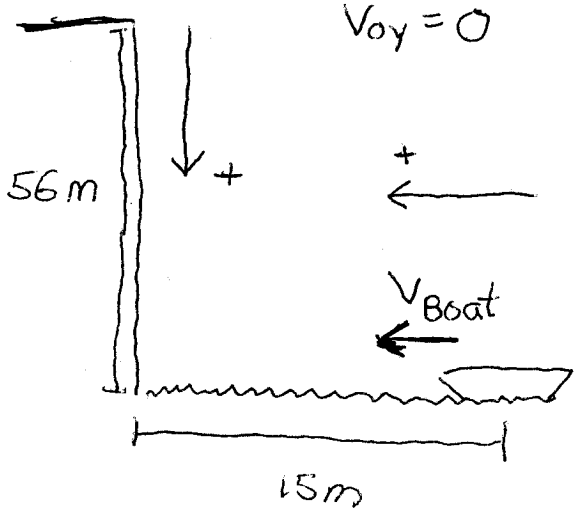
$V_{oy} = 0$ $a_{Boat} = 0$

$56m = \frac{1}{2} g t^2$

so $t = 3.4s$

$15m = V_{Boat}(3.4s)$

$V_{Boat} = 4.4 m/s$




B) Same problem really

$\Delta X_{Rock} = 15m$

$\Delta y_{Rock} = 56m$

$V_{oy\,Rock} = 0$

$V_{ox} = unknown$

$a = g = +9.8 m/s^2$

$56m = \frac{1}{2} g t^2$

$t = 3.4s$

$15m = V_{x\,Rock}(3.4s)$

$V_{x\,Rock} = 4.4 m/s$

C)