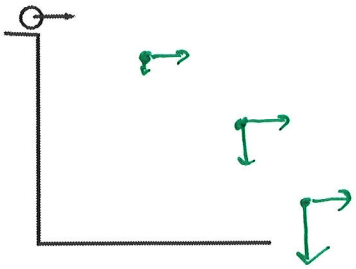
Practice for Proficiency
2D motion
Kicked Horizontally off a Cliff

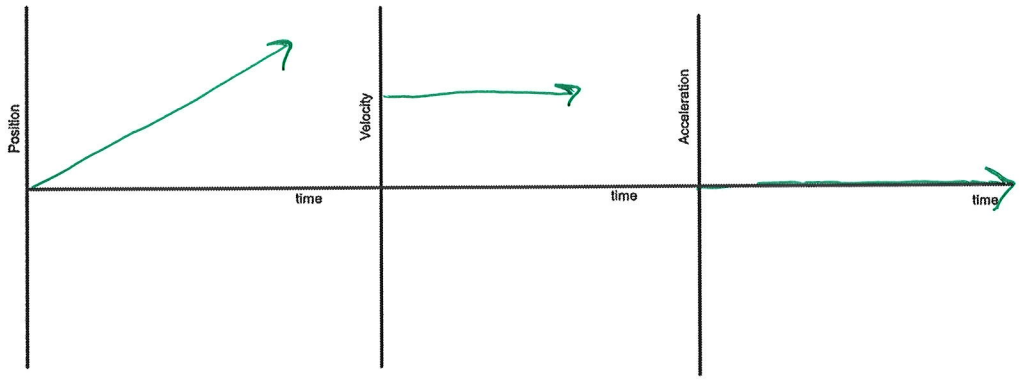
A ball is kicked off a cliff with a height of 25m and an initial speed of2.5m/s

a. Draw 4 dots representing the ball with two vector arrows on each ball representing the velocity in both X and Y directions.

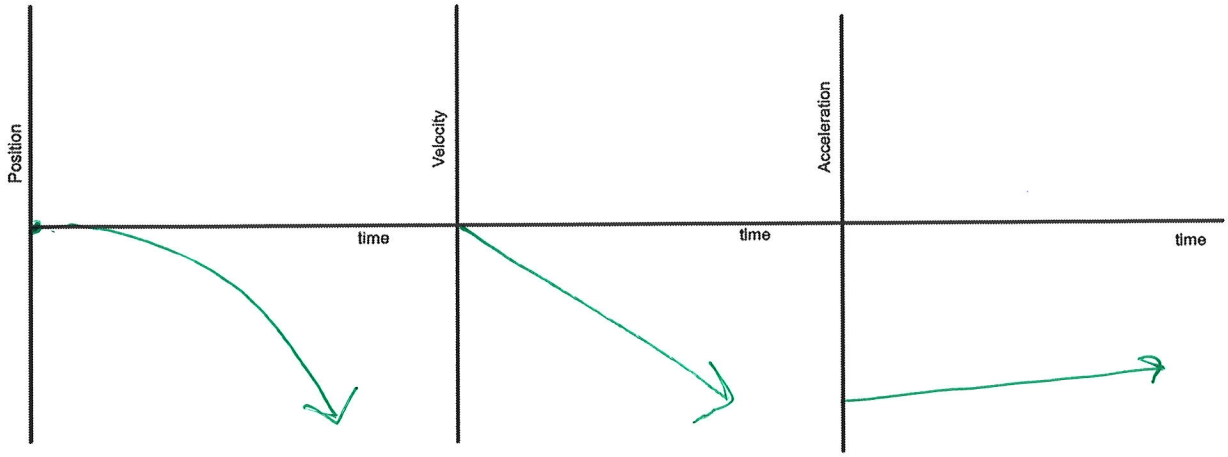


b. On the graphs below, show how the graph of each X and Y dimension would look.

c. (x) Component – Refrence point. 0,0 is top of cliff



d. (Y) Component



e. Calculate the time it takes the ball to hit the ground for the example above.

$t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \cdot 25}{10}} = \sqrt{5} \approx 2.2$

f. How far did the ball land away from the base of the wall?

$x_t = v_i t \qquad 2.5 \cdot \sqrt{5} = 5.59\ m$

g. How fast is the ball traveling in X when it hits the ground? 2.5 $a = 0$

h. How fast is the ball traveling in Y when it hits the ground? $v_t = v_i + at$

$0 + 10 \cdot 2.2 = 22\ m/s$

i. What is the inline speed of the ball when it hits the ground?

2.5 → ↓ 22 $\approx 22.1\ m/s$

j. Using letters, derive a formula for the time in the air.

* it would appear ball is mostly just going straight down.

Triple the speed of the ball off the cliff.

a. If you have not done so yet... Write a formula using variable for the time off the cliff.

$y_t = y_0 + v_i t + \frac{gt^2}{2}$

b. How does the time in the air change?

Same -

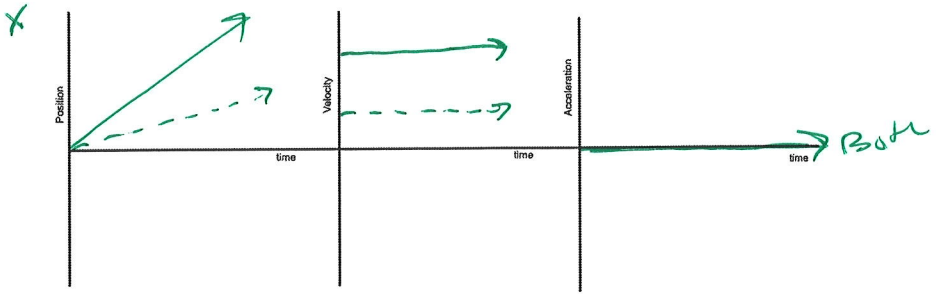
c. How does the distance traveled change?

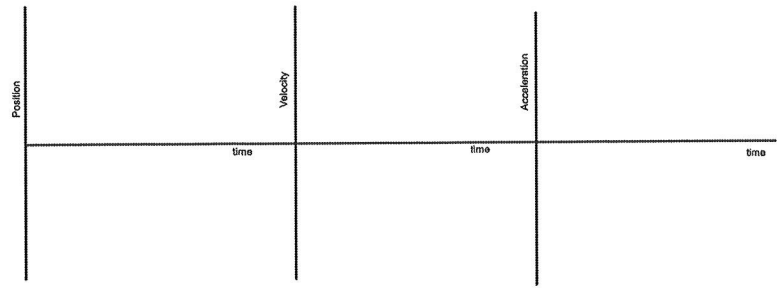
double

$y_t = \frac{gt^2}{2} \Rightarrow \sqrt{\frac{2y_t}{g}} = t$

$x_t = v_i t$

d. On the graph below, I want to draw the first ball in as a dashed line and the second ball as a solid line.





No change
Both same