Nolan and Rodger are throwing snowballs into a parking lot from there balcony that is 144 feet above ground. Nolan is throwing snowballs with an upward velocity of 128 feet per second. Rodger is simply dropping his snowballs over the balcony edge. $-16 \rightarrow$ gravity

$$h(t) = -16t^2 + v_0 t + h_0$$

a. Write a function rule that will represent the height from the ground as a function of time for a Nolan thrown snowball.

$$h(t) = -16t^2 + 128t + 144$$

b. Find the height of a Nolan thrown snowball at 3 seconds? Show your work.

$$h(3) = -16(3)^2 + 128(3) + 144$$

$$= 348 \text{ ft}$$

c. Find the height of a Nolan thrown snowball at 7 seconds? Show your work.

$$h(7) = -16(7)^2 + 128(7) + 144$$

$$256 \text{ ft}$$

d. When does a Nolan thrown snowball hit the ground?

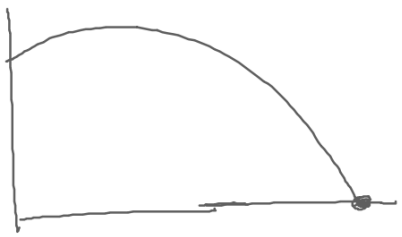
$h(t) = -16t^2 + 128t + 144$

$\frac{0}{-16} = \frac{-16t^2 + 128t + 144}{-16}$

$0 = t^2 - 8t - 9$

$(t-9)(t+1) = 0$

$t = 9 \quad t = -1$



e. Find the maximum height of a Nolan thrown snowball. What time does this happen?

$h(t) = t^2 - 8t - 9$

$X = -\frac{b}{2a}$

$= \frac{8}{2(1)} = 4 \text{ sec}$

$\frac{9 + (-1)}{2} = \frac{8}{2} = 4 \text{ sec}$

$h(4) = -16(4)^2 + 128(4) + 144$

max height = 400 ft

happens @ 4 sec.

g. Write a function rule that will represent the height from the ground as a function of time for a Rodger dropped snowball.

$h(t) = -16t^2 + \underbrace{v_0 t}_{\text{zero}} + h_0$

$h(t) = -16t^2 + h_0$

$h(t) = -16t^2 + 144$

h. When does a Rodger dropped snowball hit the ground?

$h(t) = -16t^2 + 144$

$0 = -16t^2 + 144$

$16t^2 = 144$

$t^2 = 9$

$t = \boxed{3}, -3$

i. How much longer is does it take for a Nolan thrown snowball to hit the ground than a Rodger dropped snowball?

$9 - 3 = 6$ sec