Bill and Ted are throwing snowballs into the parking lot from their third story balcony with initial height of 24 feet and upward velocity of 48 feet per second.

$h(t) = h_0 + V_0 t - 16t^2$

$h_0 \rightarrow$ Initial height

Write a function rule that will represent the given scenario for height as a function of time.

$V_0 \rightarrow$ Initial Velocity

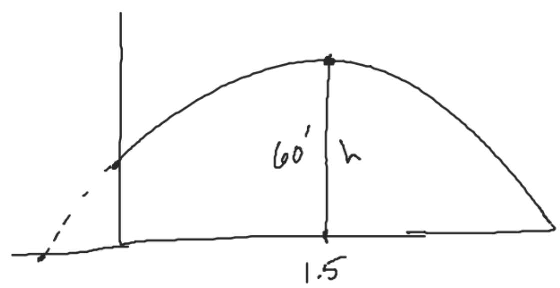
$h(t) = 24 + 48t - 16t^2$

$h(t) = -16t^2 + 48t + 24$

Without graphing, find the time when the snowball reaches its maximum height?

$X = \frac{-b}{2a} = \frac{-48}{2(-16)} = \frac{48}{32} = 1.5$ sec.

What is the maximum height?



$h(1.5) = 24 + 48(1.5) - 16(1.5)^2$

$= 60$ ft

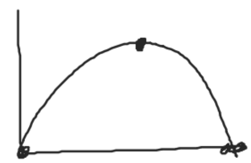
Mike owns his own Bungee Jump Business. He has calculated the Income for his company by the following function $I(p) = 50p - p^2$. The following graph shows income as function of price for Mike's business where ***p*** is the ticket price and ***I*** is the income.

$$I(p) = 50p - p^2$$
$$= p(50-p)$$

Without graphing, find the price of the ticket that will yield a profit of zero dollars?

$$0 = p(50-p)$$

$p = 0$ | $50 - p = 0$, $50 = p$



What price should Mike charge to maximize his profit?

$p = \$25$

Based on this model what is Mike's maximum profit?

$$I(25) = 50(25) - (25)^2$$
$$= \$625$$

Alex hit a baseball 5 feet off the ground. After 5 seconds the ball had a height of 240 feet. Find the initial upward velocity of the baseball. Write an equation for the path of the baseball over time.

$(5, 240)$

$t \quad h(t)$

$h(t) = h_0 + V_0 t - 16t^2$

$h(t) = 5 + V_0 t - 16t^2$

$240 = 5 + V_0(5) - 16(5)^2$

$240 = 5 + 5V_0 - 400$

$240 = 5V_0 - 395$

$+395 \qquad + 395$

$635 = 5V_0$

$V_0 = 127 \text{ ft/sec}$

$h(t) = 5 + 127t - 16t^2$

Without using graphing technology, sketch the pattern of graphs you would expect for the next set of quadratics functions. Justify your reasoning.

$-16+32$

$y = -x^2 + 8x$

open Down

Y-intercept $(0,0)$

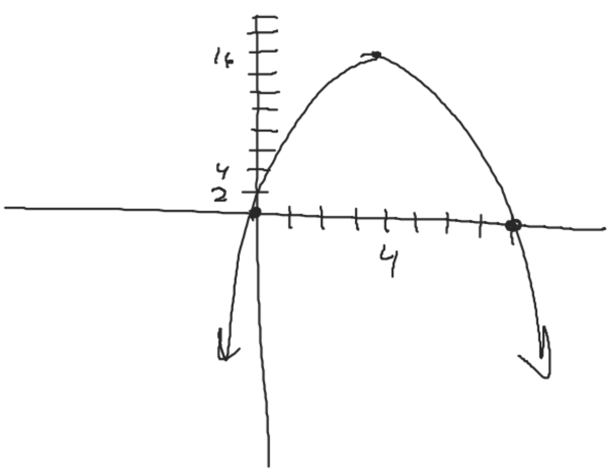
X-intercepts

$0 = -x(x-8)$

$-x=0 \qquad x-8=0$

$x=0 \qquad x=8$

Vertex $(4,16)$



$y = x^2 + 6x - 2$

Y-intercept $(0,-2)$

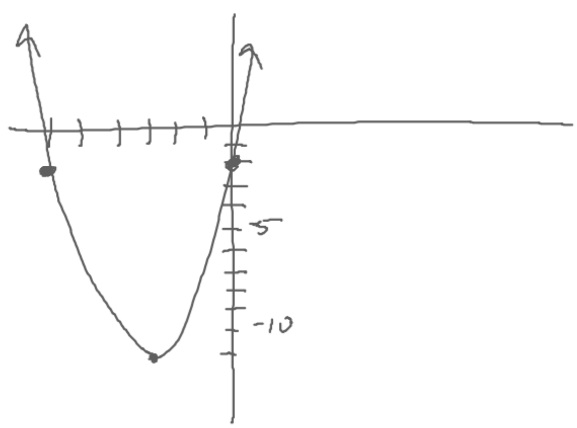
Opens up

$x = \frac{-b}{2a} = \frac{-6}{2(1)} = -3$

$(-3)^2 + 6(-3) - 2$

$9 - 18 - 2 = -11$

$(-3,-11)$



Match the equation to the graph and be prepared to explain your answer.

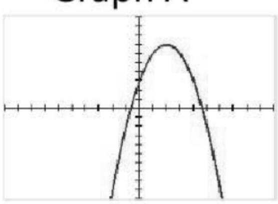
Rule I $y = x^2 - 4x$

Rule II $y = x^2 + 3x - 1$

Rule III $y = -x^2 + 4x + 3$

Rule IV $y = -4x^2 + 2x + 3$

Graph A



Rule $-x^2+4x+3$

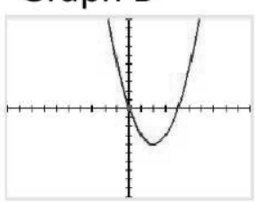
Explain

opens Down

y-int = 3

a = 1

Graph B

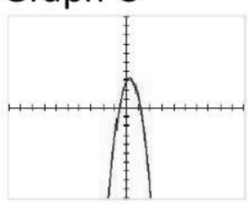


Rule x^2-4x

Explain

y-int = 0

Graph C



Rule $-4x^2+2x+3$

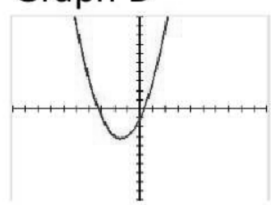
Explain

Opens Down

y-int = 3

Vertical stretch by factor of 4

Graph D



Rule x^2+3x-1

Explain

y-intercept → -1

For each function, explain what you can learn about the shape and location of its graph by looking at the coefficients and constant term in the rule.

$h = 15 - 16t^2$

$-16t^2 + 15$

Open Down

Shift up 15

Vert Stretch by factor 16

$h = 2 + 40t - 16t^2$

$-16t^2 + 40t + 2$

opens Down

y-int $(0,2)$

Shift Right

Vert Stretch factor 16

$h = 0.004x^2 - x + 80$

Vertical Compression Factor .004

Shift Right

Y-intercept $(0,80)$

opens up

$h = 0.\underline{05}s^2 + 1.1s$

Vert Compression Factor .05

Shift Left

opens up

Y-intercept $(0,0)$

$.05s(s+22)$

$s=0 \qquad s=-22$