Sec. 9.2 Quadratic Functions

$y = ax^2 + bx + c$

axis of symmetry: $x = -\frac{b}{2a}$

vertex: $(-\frac{b}{2a} = h$, plug in to find $y)$

Problem 1: Graph $y = x^2 - 6x + 2$

$-\frac{b}{2a} = \frac{6}{2 \cdot 1} = 3$

$a = 1$

$b = -6$

axis of sym: $x = 3$

vertex: $(3, -7)$

$y = 3^2 - 6 \cdot 3 + 2$

$9 - 18 + 2$

$-9 + 2 = -7$

x	y
4	-6
5	-3

$4^2 - 6 \cdot 4 + 2$

$16 - 24 + 2$

$-8 + 2$

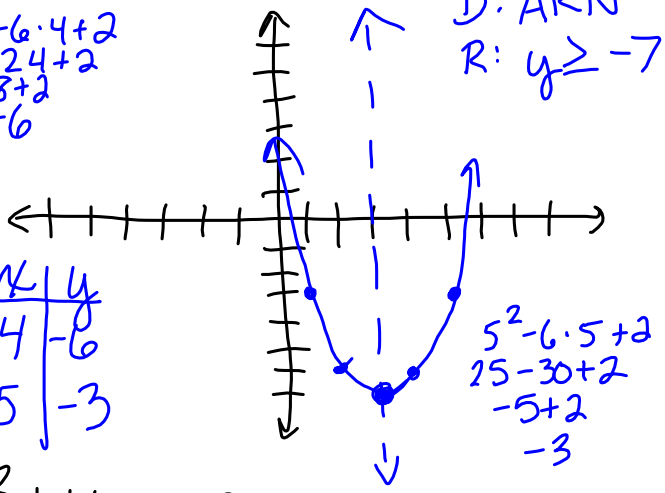
-6

$5^2 - 6 \cdot 5 + 2$

$25 - 30 + 2$

$-5 + 2$

-3



D: ARN

R: $y \geq -7$

Graph $y = -x^2 + 4x - 2$

$a = -1$

$b = 4$

$-\frac{b}{2a} = \frac{-4}{2(-1)} = \frac{-4}{-2} = 2$

aos: $x = 2$

v: $(2, 2)$

$-(2)^2 + 4(2) - 2$

$-4 + 8 - 2$

$4 - 2$

2

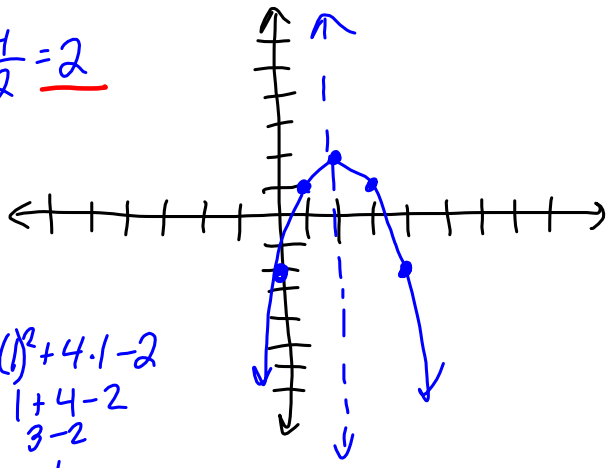
x	y
0	-2
1	1

$-(1)^2 + 4 \cdot 1 - 2$

$-1 + 4 - 2$

$3 - 2$

1



Find the axis of symmetry and vertex

a. $y = x^2 - 8x - 7$

b. $y = -3x^2 + 12x + 1$

Problem 2:

Daniel kicks a soccer ball up into the air with an initial velocity of 64 feet per second. The ball is 2 feet above the ground when it is kicked. How long will it take the ball to reach its maximum height? How high above the ground will it be? What is the range of the function?

$h = -16t^2 + 64t + 2$ (starting height)

max/min → y-value of the vertex

$x = -\frac{b}{2a} = \frac{-64}{2(-16)} = \frac{-64}{-32} = 2$

V: (2, 68)

t, h

$y = -16(2)^2 + 64(2) + 2$

$-16 \cdot 4 + 128 + 2$

$-64 + 128 + 2$

$64 + 2 = 66$

max height: 66 ft.

2 seconds

Range: $0 \le h \le 66$

A baseball is thrown into the air with an upward velocity of 30 ft/s. Its height, h, in feet, after t seconds is given by the function $h = -16t^2 + 30t + 6$. How long will it take for the ball to reach its maximum height? What is the ball's maximum height? What is the range of the function?

$-\frac{b}{2a} = \frac{-30}{2(-16)} = \frac{-30}{-32} = \frac{15}{16} = t$

V: (t, h)

$\left(\frac{15}{16}\right.$

$-16\left(\frac{15}{16}\right)\left(\frac{15}{16}\right) + 30\left(\frac{15}{16}\right) + 6 \cdot \frac{16}{16}$

$-\frac{225}{16} + \frac{450}{16} + \frac{96}{16} \quad \frac{321}{16} =$ (225)

$\frac{15}{16}$ seconds time

$20\frac{1}{16}$ feet max height

0 to $20\frac{1}{16}$ feet

R: $0 \le h \le 20\frac{1}{16}$