

9-2

#5

## #5 Rocket Scientist

① A.O.S. Graph A

$$x = -2$$

② VERTEX Graph A

$$(-2, -5)$$

③ A.O.S. Graph B

$$x = 3$$

④ VERTEX Graph B

$$(3, 4)$$

⑤  $y = x^2 - 4x + 1$

A.O.S.  $\rightarrow x = \frac{4}{2} = 2 \quad x = 2$

$$y = 2^2 - 4(2) + 1$$

$$= 4 - 8 + 1$$

$$= -4 + 1 = -3$$

$$(2, -3)$$

⑥  $f(x) = x^2 + 6x + 5$

A.O.S.  $\rightarrow x = \frac{-6}{2} = -3 \quad x = -3$

$$y = (-3)^2 + 6(-3) + 5$$

$$= 9 - 18 + 5$$

$$= -9 + 5 = -4$$

$$(-3, -4)$$

⑦  $y = 2x^2 - 9$

A.O.S.  $\rightarrow x = \frac{0}{2} = 0 \quad x = 0$

$$y = 2(0)^2 - 9$$

$$y = 0 - 9$$

$$y = -9$$

$$(0, -9)$$

⑧  $y = 2x^2 + 8x - 3$

A.O.S.  $\rightarrow \frac{-8}{2(2)} = \frac{-8}{4} = -2 \quad x = -2$

$$y = 2(-2)^2 + 8(-2) - 3$$

$$= 2(4) - 16 - 3$$

$$= 8 - 16 - 3 = -11$$

$$(-2, -11)$$

⑨  $f(x) = -3x^2 + 10x + 4$

A.O.S.  $\rightarrow x = \frac{-10}{2(-3)} = \frac{-10}{-6} = 1 \quad x = 1$

$$y = -3(1)^2 + 10(1) + 4$$

$$= -3 + 10 + 4$$

$$= 3 + 4 = 7$$

$$(1, 7)$$

⑩  $y = -2x^2 + 10x - 7$

A.O.S.  $\rightarrow x = \frac{-10}{2(-2)} = \frac{-10}{-4} = \frac{5}{2} \quad x = \frac{5}{2}$

$$y = -2\left(\frac{5}{2}\right)^2 + 10\left(\frac{5}{2}\right) - 7$$

$$= -2\left(\frac{25}{4}\right) + 25 - 7$$

$$= -12.5 + 18 - 7$$

$$= 12.5 - 7 = 5.5$$

$$\left(2.5, 5.5\right)$$

$$\textcircled{11} \quad y = \frac{1}{2}x^2 + 4x + 1$$

$$\text{A.O.S.} \rightarrow x = \frac{-4}{2(\frac{1}{2})} = \frac{-4}{1} = -4 \quad x = -4$$

$$y = \frac{1}{2}(-4)^2 + 4(-4) + 1$$

$$= \frac{1}{2}(16) - 16 + 1$$

$$= 8 - 16 + 1 = -7 \quad \boxed{(-4, -7)}$$

$$\textcircled{12} \quad f(x) = -\frac{1}{2}x^2 + 3x - 2$$

$$\text{A.O.S.} \rightarrow x = \frac{-3}{2(-\frac{1}{2})} = \frac{-3}{-1} = 3 \quad x = 3$$

$$y = -\frac{1}{2}(3)^2 + 3(3) - 2$$

$$= -\frac{1}{2}(9) + 9 - 2$$

$$= -4.5 + 9 - 2 = 2.5$$

$$\boxed{(3, 2.5)}$$

$$\textcircled{13} \quad h = -16t^2 + 64t + 5$$

(MAX = VERTEX;  $t = x$  value)

$$\text{A.O.S.} \rightarrow x = \frac{-64}{2(-16)} = \frac{-64}{-32} = 2$$

$$\boxed{2 \text{ seconds}}$$

$$\textcircled{14} \quad (\text{height} = y \text{ value})$$

$$h = -16(2)^2 + 64(2) + 5$$

$$h = -16(4) + 128 + 5$$

$$h = -64 + 128 + 5$$

$$h = 69$$

$$\boxed{69 \text{ ft.}}$$

$$\textcircled{15} \quad h = -16t^2 + 80t + 3$$

(MAX = VERTEX;  $t = x$  value)

$$\text{A.O.S.} \rightarrow x = \frac{-80}{2(-16)} = \frac{-80}{-32} = 2.5$$

$$\boxed{2.5 \text{ seconds}}$$

$$\textcircled{16} \quad (\text{height} = y \text{ value})$$

$$h = -16(2.5)^2 + 80(2.5) + 3$$

$$h = -16(6.25) + 200 + 3$$

$$h = -100 + 200 + 3$$

$$h = 103$$

$$\boxed{103 \text{ ft.}}$$

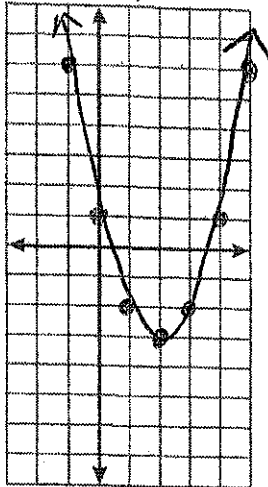
# Quadratic graFUN

#6

Find the vertex of the graph of the function and write its coordinates in the outlined cells of the table. Then find points on each side of the vertex. Plot the points and draw the graph.

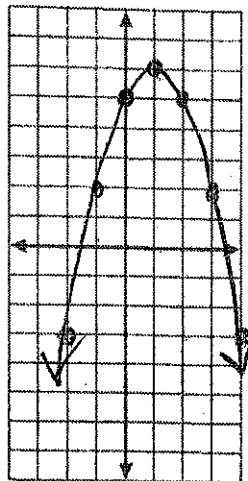
1  $y = x^2 - 4x + 1$

x	y
-1	0
0	1
1	-2
2	-3
3	-2
4	1
5	0



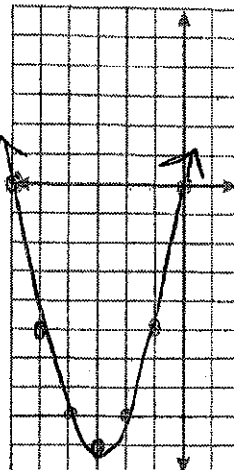
2  $y = -x^2 + 2x + 5$

x	y
-2	-3
-1	2
0	5
1	6
2	5
3	2
4	-3



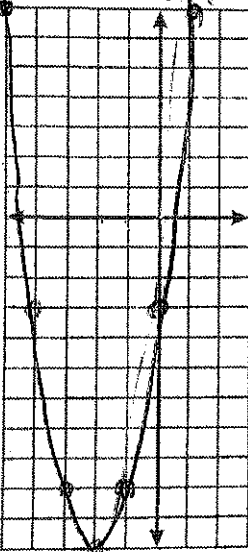
3  $y = x^2 + 6x$

x	y
-6	0
-5	-5
-4	-8
-3	-9
-2	-8
-1	-5
0	0



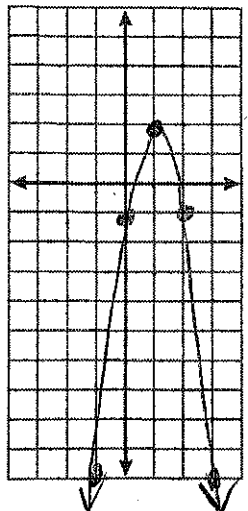
4  $y = 2x^2 + 8x - 3$

x	y
5	7
-4	-3
-3	-9
-2	-11
-1	-9
0	-3
1	7



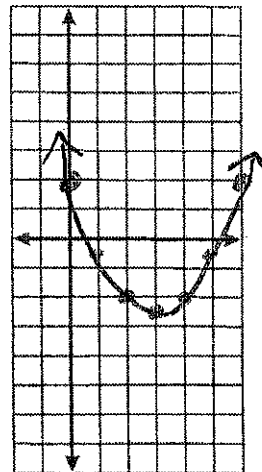
5  $y = -3x^2 + 6x - 1$

x	y
-1	-10
0	-1
1	2
2	-1
3	-10

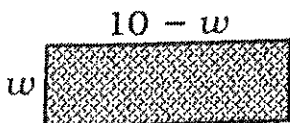


6  $y = \frac{1}{2}x^2 - 3x + 2$

x	y
0	2
1	-5
2	-2.5
3	-2
4	-5
5	-2
6	2



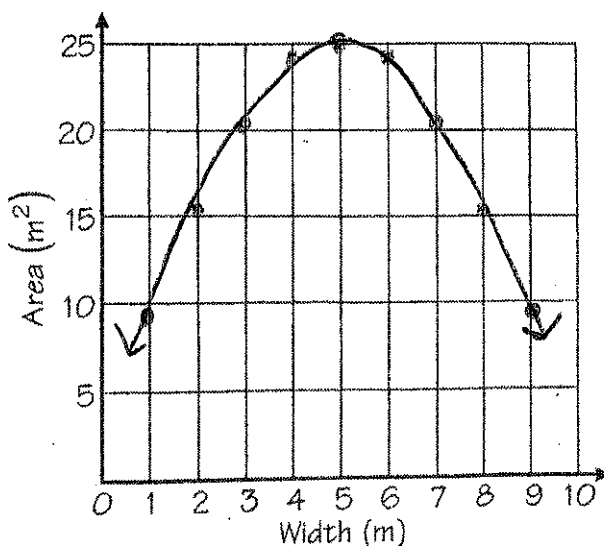
7 Suppose you have 20 meters of fence to go around a rectangular garden. The width and length of the garden are represented in the figure below, where  $w$  = width.



The area of the garden is given by the formula:  $A = 10w - w^2$ .

Complete the table and graph to show how area depends on width.

w (m)	A (m <sup>2</sup> )
1	9
2	16
3	21
4	24
5	25
6	24
7	21
8	16
9	9



#4  
work

①  $y = x^2 - 4x + 1$   
A.O.S.  $\rightarrow x = \frac{4}{2(1)} = 2$

$y = 2^2 - 4(2) + 1$   
 $y = 4 - 8 + 1$   
 $y = -4 + 1 \quad (2, -3)$   
 $y = -3$

Plugging in ...

$1^2 - 4 + 1$        $(-1)^2 - 4 + 1$   
 $1 - 4 + 1 = -2$        $1 + 4 + 1 = 6$

$3^2 - 12 + 1$        $4^2 - 16 + 1$   
 $9 - 12 + 1 = -2$        $16 - 16 + 1 = 1$

$5^2 - 20 + 1$   
 $25 - 20 + 1 = 6$

②  $y = -x^2 + 2x + 5$   
A.O.S.  $\rightarrow x = \frac{-2}{2(-1)} = \frac{-2}{-2} = 1$

$y = -(1)^2 + 2(1) + 5$   
 $y = -1 + 2 + 5$   
 $y = 1 + 5 \quad (1, 6)$   
 $y = 6$

Plugging in ...

$-(-2)^2 + 2(-2) + 5$   
 $-4 - 4 + 5 = -3$

$-(-1)^2 + 2(-1) + 5$   
 $-1 - 2 + 5 = 2$

③  $y = x^2 + 6x$   
A.O.S.  $\rightarrow x = \frac{-6}{2(1)} = -3$

$y = (-3)^2 + 6(-3)$   
 $y = 9 - 18$   
 $y = -9 \quad (-3, -9)$

Plugging in ...

$(-6)^2 + 6(-6)$        $(-5)^2 + 6(-5)$   
 $36 - 36 = 0$        $25 - 30 = -5$

$(-4)^2 + 6(-4)$   
 $16 - 24 = -8$

④  $y = 2x^2 + 8x - 3$   
A.O.S.  $\rightarrow x = \frac{-8}{2(2)} = \frac{-8}{4} = -2$

$y = 2(-2)^2 + 8(-2) - 3$   
 $y = 2(4) - 16 - 3$   
 $y = 8 - 16 - 3$   
 $y = -8 - 3 = -11 \quad (-2, -11)$

Plugging in ...

$2(-5)^2 + 8(-5) - 3$        $2(-3)^2 + 8(-3) - 3$   
 $2(25) - 40 - 3$        $2(9) - 24 - 3$   
 $50 - 40 - 3 = 7$        $18 - 24 - 3 = -9$

$$(5) \quad y = -3x^2 + 6x - 1$$

$$\text{A.O.S} \rightarrow x = \frac{-6}{2(-3)} = 1$$

$$y = -3(1)^2 + 6(1) - 1$$

$$y = -3 + 6 - 1$$

$$y = 3 - 1 \quad (1, 2)$$

$$y = 2$$

Plugging in...

$$-3(-1)^2 + 6(-1) - 1$$

$$-3 - 6 - 1 = -10$$

$$(6) \quad y = \frac{1}{2}x^2 - 3x + 2$$

$$\text{A.O.S} \rightarrow x = \frac{3}{\frac{1}{2}} = \frac{3}{1} = 3$$

$$y = \frac{1}{2}(9) - 3(3) + 2$$

$$y = 4.5 - 9 + 2$$

$$y = -4.5 + 2 \quad (3, -2.5)$$

$$y = -2.5$$

Plugging in...

$$\frac{1}{2}(1)^2 - 3(1) + 2$$

$$\frac{1}{2} - 3 + 2 = -\frac{1}{2}$$

$$\frac{1}{2}(2)^2 - 3(2) + 2$$

$$\frac{1}{2}(4) - 6 + 2$$

$$2 - 6 + 2 = -2$$

$$(7) \quad A = 10 - 1 = 9$$

$$A = 20 - 4 = 16$$

$$A = 30 - 9 = 21$$

$$A = 40 - 16 = 24$$

$$A = 50 - 25 = 25$$

$$A = 60 - 36 = 24$$

$$A = 70 - 49 = 21$$

$$A = 80 - 64 =$$

$$A = 90 - 81 =$$