: 36

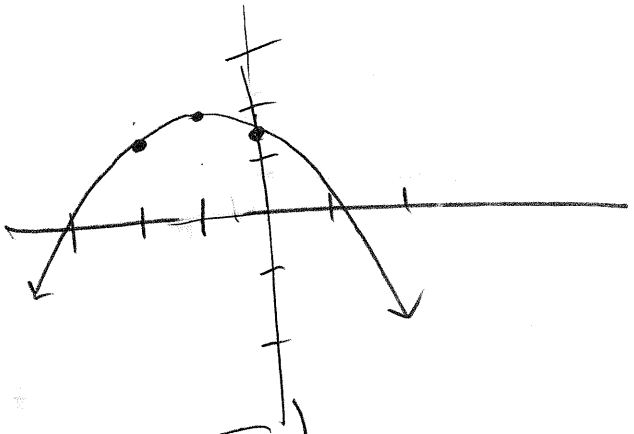
#33 Graph

#33 $f(x) = -\frac{1}{2}(x+1)^2 + 2$

↑ ← 1 ↓ ↑ 2 ↓

flipped

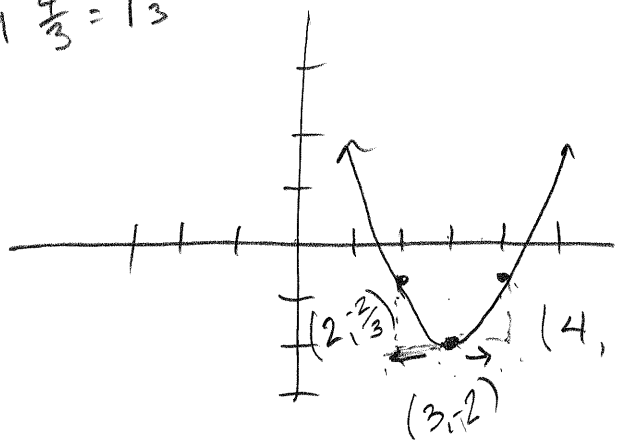
stretched by factor of $\frac{1}{2}$



#36 $f(x) = \boxed{\frac{4}{3}}(x-3)^2 - 2$

→ 3 ↓ 2

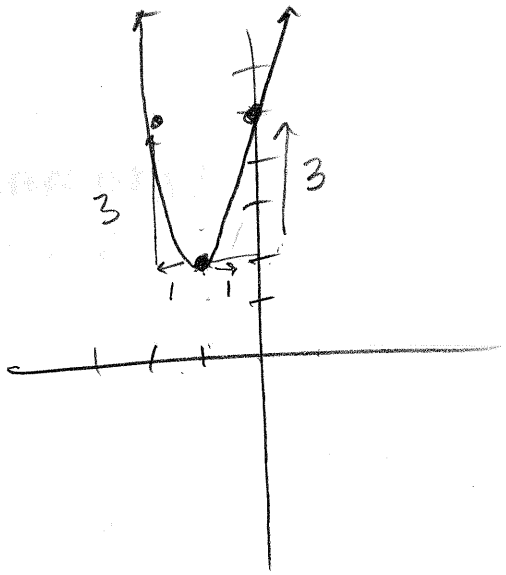
stretch by $\frac{4}{3} = 1\frac{1}{3}$



x	y
2	$\frac{4}{3}(2-3)^2 - 2$ $\frac{4}{3} - 2 = -\frac{2}{3}$
4	

$f(x) = 3(x+1)^2 + 2$

↓ Stretch is 3 ← −1 ↑ 2



x	y
0	
Vertex → −1	
−2	

Sec 9.6

Recall Short cut formula for Vertex

$x = \frac{-b}{2a}$ $y = f\left(\frac{-b}{2a}\right)$

To Graph $f(x) = ax^2 + bx + c$

1st Decide if it opens up or down by examining a

a-positive : opens up

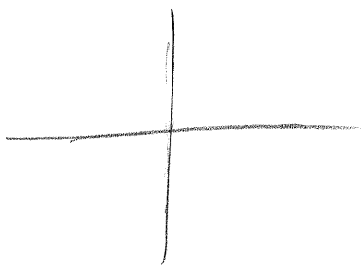
a-negative: opens down

2nd Find the Vertex

3rd Find Any Intercepts

x-ints: set $y=0$

y-int: set $x=0$



4th Complete the graph by plotting Vertex and Intercepts as well as any additional points as needed or using the axis of symmetry

Graph: $y = x^2 + 4x + 3$ opens up since $a = +1$

Find Vertex: $x = \frac{-b}{2a} = \frac{-4}{2(1)} = \frac{-4}{2} = -2$

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

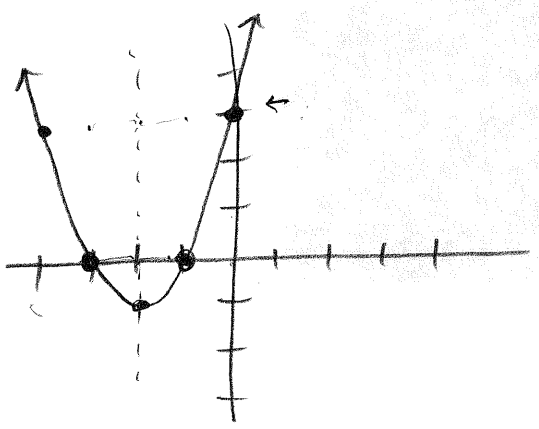
$= 4 + -8 + 3$

$= -1$

Find int: y-int: $x = 0$

$(0, 3)$ $y = 0^2 + 4(0) + (3)$

$= 3$



x-int: $y = 0$

$0 = x^2 + 4x + 3$

$0 = (x+3)(x+1)$

$x + 3 = 0$ $\quad x + 1 = 0$

$-3 \quad -3 \quad -1 \quad -1$

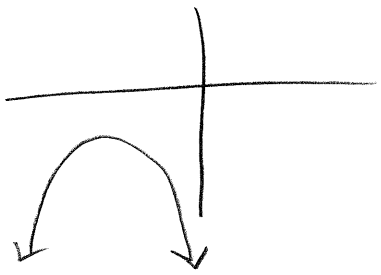
$x = -3, -1$

$(-3, 0), (-1, 0)$

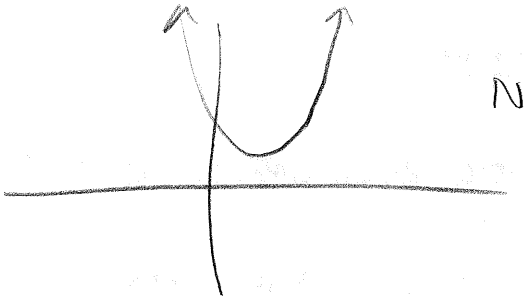
Sometimes: 1 x-int, 2 x-int, 0 x-int } found by solving Quadratic

How many solutions is determined by the discriminant

discriminant $= b^2 - 4ac$

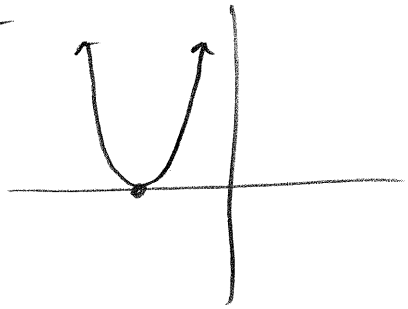


or



NO x-int

1 - x-int

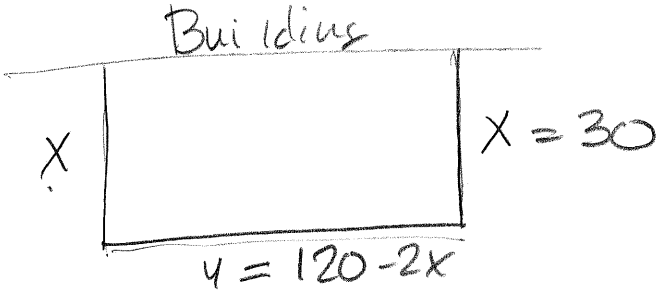


Maximum of open down parabola
or minimum of open up parabola
occur at the vertex

Example 6

have 120 ft of fence, one side is Building

Find: Max Area



Total: $2x + y = 120$

$-2x \quad -2x$

$y = 120 - 2x$

$L = 120 - 2(30)$

$A = w \cdot L$

$A = x(120 - 2x)$

$A = 120x - 2x^2$

$= -2x^2 + 120x$

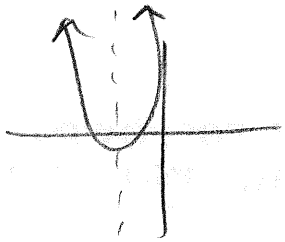
Vertex: $x = \frac{-b}{2a} = \frac{-120}{2(-2)} = \frac{-120}{-4}$

$= 30$

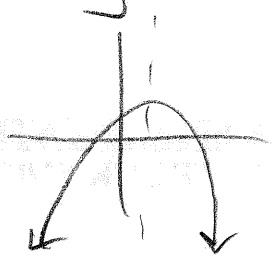
Width = 30 ft

Length = 60 ft Area = 1800 ft^2

Vertical Parabolas: $y = ax^2 + bx + c$

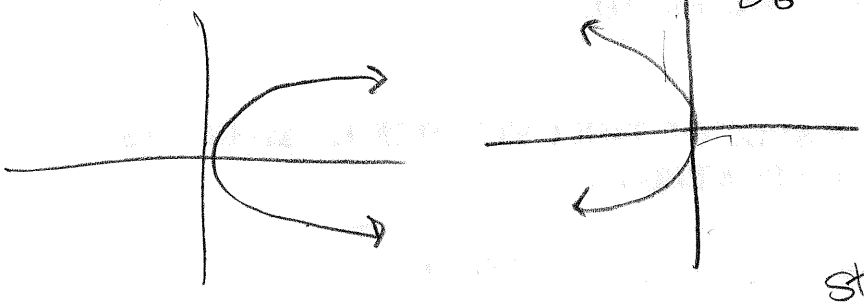


or



Vertex: $\left(-\frac{b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

Horizontal Parabola : Not function



Eg: $x = ay^2 + by + c$

$x = a(y-k)^2 + h$

stretch — up/down k — left/right

Vertex : (h, k)

Vertex: shortcut $y = \frac{-b}{2a}$

a tells us left/Right

a is positive opens Right

a is Negative opens left

31 $x = \underset{a=3}{3}y^2 + \underset{b=12}{12}y + \underset{c=5}{5}$

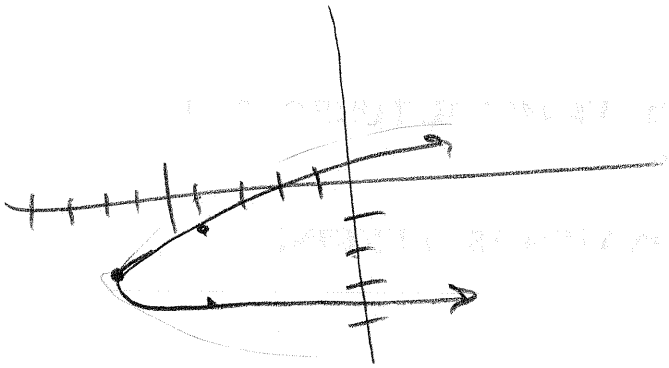
$y = \frac{-12}{2(3)} = \frac{-12}{6} = -2$

$x = 3(-2)^2 + 12(-2) + 5$

$3 \cdot 4 + -24 + 5$

$12 - 24 + 5 = -7$

Vertex: $(-7, -2)$



table

x	y	
-7	-2	
-4	-1	← Ephraim
-4	-3	← Richfield

Domain: $[-7, \infty)$
(x-values)

Range: $(-\infty, \infty)$
(y-values)

$x = 3y^2 + 12y + 5$

$3(-3)^2 + 12(-3) + 5$

$27 - 36$