

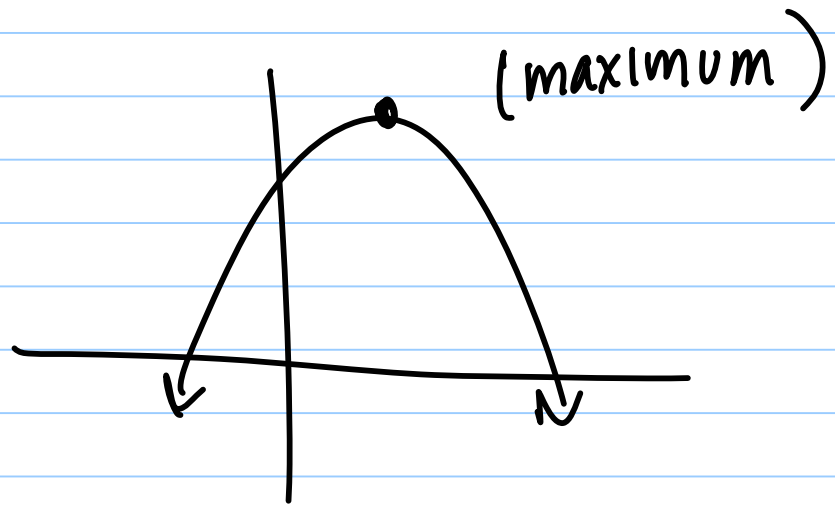
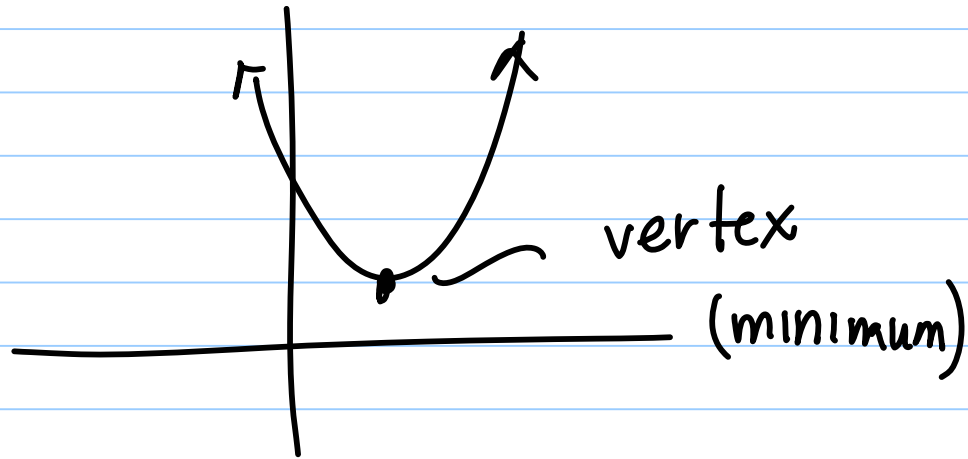
# Section 2.1/2.2 : Intro to Quadratics

Note Title

6/19/2009

Quadratics :

vertex  $(h, k)$



Vertex Form of a Quadratic Function.

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

$(h, k)$ : vertex

$a$ : tells us how "narrow" the parabola is

$a > 0$  : parabola opens upward

$a < 0$  : parabola opens downward

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## General Form of a Quadratic function

$$f(x) = ax^2 + bx + c \quad a \neq 0$$

Vertex:  $(h, k)$ , where  $h = \frac{-b}{2a}$

$$k = f(h)$$

Ex] Find the vertex of  
 $f(x) = \underline{x^2 + 6x + 8}$  in two ways

1) Vertex formula:  $h = \frac{-b}{2a} = \frac{-6}{2(1)} = -3$

Vertex:  $(-3, -1)$

$$k = f(-3)$$

[Vertex form

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

$$= (-3)^2 + 6(-3) + 8$$

$$f(x) = (x-h)^2 + k$$

$$= 9 - 18 + 8 = -1$$

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

2) "Completing the Square" (like online HW)

$$f(x) = x^2 + 6x + 8$$

$$= x^2 + 6x + \underline{9} - \underline{9} + 8$$

take  $\frac{1}{2}b = \frac{1}{2}(6) = 3$ ; square it  $3^2 = 9$

Add 0  
in a  
creative  
way

$$= \frac{x^2 + 6x + 9}{-9 + 8}$$

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

Vertex:  $(-3, -1)$

Vertex: is the location of a max  
or minimum

Applications/Word Problems: this amounts  
to finding the vertex if  
you are given a quadratic  
function

# Quadratic Equations:

$$x^2 + 5x + 4 = 0$$

Finding solutions: a) factor

b) use Quadratic formula.

a)  $x^2 + 5x + 4 = 0$

$$\underbrace{(x+4)} \underbrace{(x+1)} = 0$$

Either  $x+4=0$  or  $x+1=0$

Solution:  $x=-4$  or  $x=-1$

Graphically: "Find the zeros of  $f(x) = x^2 + 5x + 4$ "  
"x-intercept"  
"roots"

↳ What this means is finding the solutions to  $x^2 + 5x + 4 = 0$ .

b) Quadratic Formula also gives us solutions:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Ex) Solve:  $2x^2 + x - 3 = 0$

for x:  $a=2$

$b=1$

$c=-3$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(2)(-3)}}{2(2)}$$

$$x = \frac{-1 \pm 5}{4}$$

$$x = \frac{-1 \pm \sqrt{1+24}}{4}$$

$$\frac{-1+5}{4} \text{ or } \frac{-1-5}{4}$$

$$x = \frac{-1 \pm \sqrt{25}}{4}$$

$$x=1 \text{ or } x=-\frac{3}{2}$$

Ex] Find the equation of the parabola with following picture:

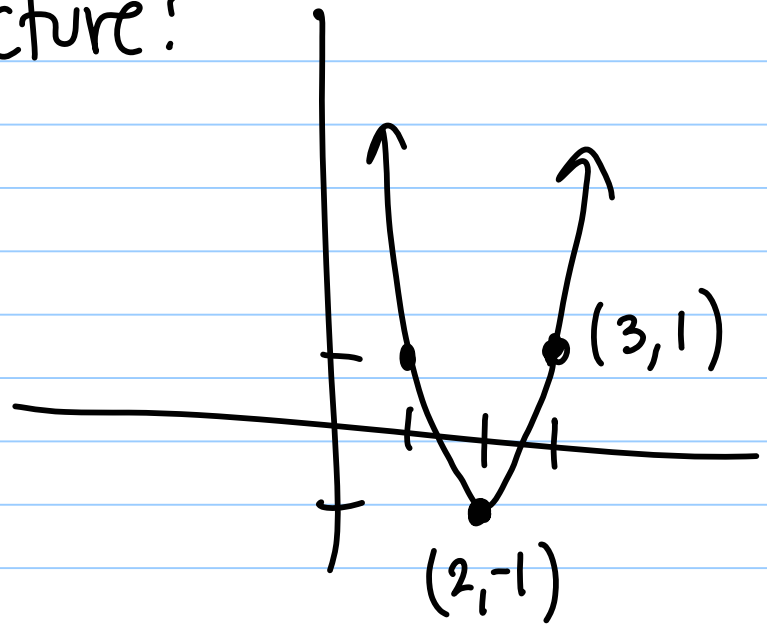
$$f(x) = a(x-h)^2 + k$$

$$f(x) = a(x-2)^2 - 1$$

$$1 = a(3-2)^2 - 1$$

$$1 = a(1) - 1$$

$$1 = a - 1 \quad \left. \vphantom{1 = a - 1} \right\} a = 2$$



Vertex Form:  $f(x) = a(x-h)^2 + k$

$$f(x) = \underline{\underline{2(x-2)^2 - 1}}$$

Standard (general) form:

$$f(x) = 2[(x-2)(x-2)] - 1$$

$$f(x) = 2[x^2 - 4x + 4] - 1$$

$$= 2x^2 - 8x + 8 - 1$$

$$\boxed{f(x) = 2x^2 - 8x + 7}$$