

B4 Alg. II 10/20/11 AA

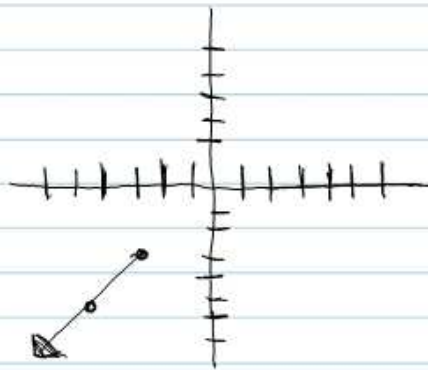
## Piecewise Function

Example:

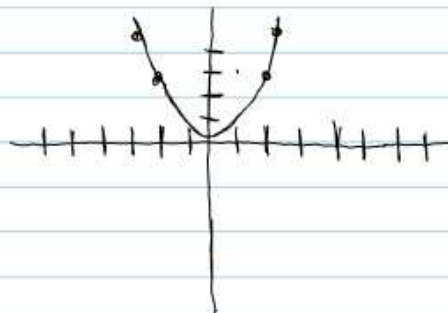
$$f(x) = \begin{cases} x, & \text{if } x \leq -3 \\ x^2, & \text{if } -3 < x < 3 \\ |x|, & \text{if } x \geq 3 \end{cases}$$

Domain  
Restriction

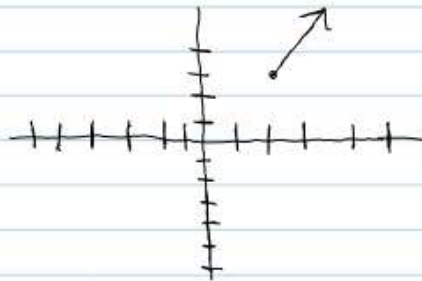
Example of  $x$ , if  $x \leq -3$ :



Example of  $x^2$ , if  $-3 < x < 3$ :

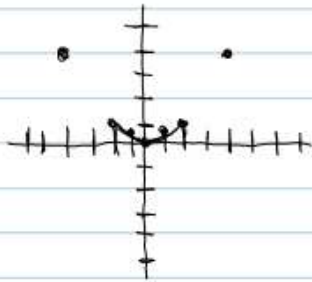


Example of  $|x|$ , if  $x \geq 3$ !



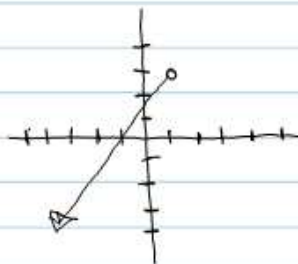
$$f(x) = \begin{cases} \frac{1}{4}x^2 & \text{if } -2 \leq x \leq 2 \\ x+2 & \text{if } x < -1 \\ -x+2 & \text{if } x > 1 \end{cases}$$

$\frac{1}{4}x^2$  if  $-2 \leq x \leq 2$ !

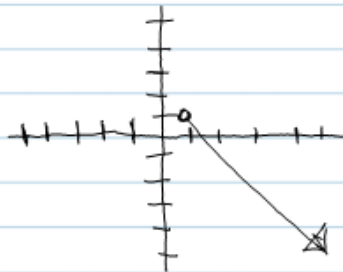


x	y
1	1/4
2	1
4	4

$x+2$  if  $x < -1$ !



~~Graph~~  $-x+2$  if  $x > 1$ :



~~\*  $\circ = < / >$  \*~~  
~~\*  $\bullet = \leq / \geq$  \*~~

\*  $\circ = < / >$  \*

\*  $\bullet = \leq / \geq$  \*

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## Quadratic Functions

• vertex form:  $f(x) = a(x-h)^2 + k$

• standard form

Parts of: Quadratic term  
Constant term  
Coefficients

• Axis of Symmetry  
a.k.a "AOS"

• Roots (zero's)

• Minimum/Maximum

Standard Form

$$ax^2 + bx + c = 0$$

quadratic  
term

constant  
term

linear  
term

$$\underbrace{ax^2 \quad bx \quad c}$$

coefficients - number next to variable

example:

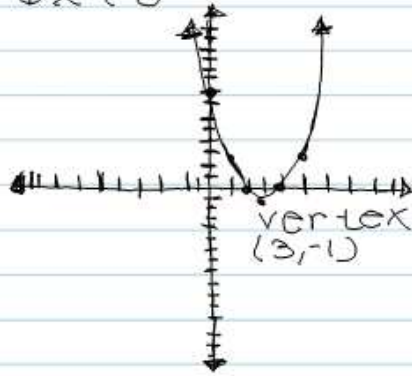
$$3x^2 - 4x + 7 = 0$$

$$3x^2 + 7 = 0$$

} both are still  
quadratic functions  
even if there is  
a term missing

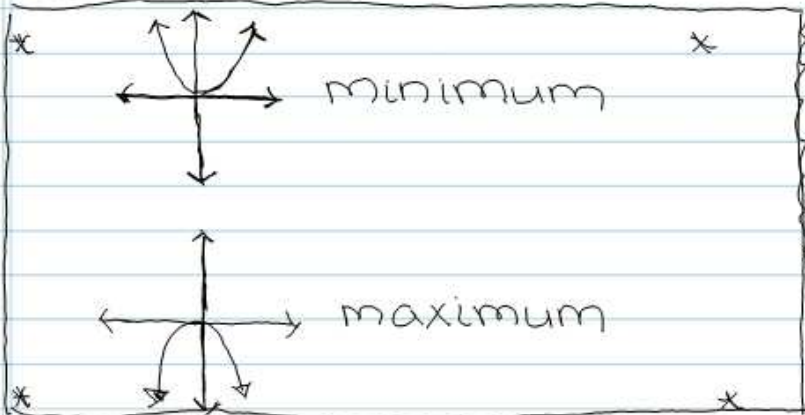
example:

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



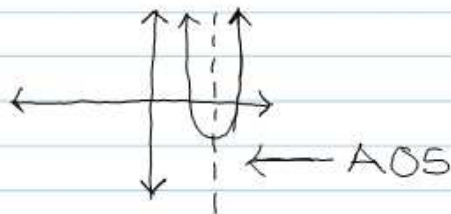
x	y
0	8
1	3
2	0
3	-1
4	0
5	3

minimum



maximum/  
minimum -  
lowest/  
highest  
point  
(vertex)

Axis of Symmetry  
"AOS"



\*Axis of Symmetry  $\rightarrow$  the "x" value of the vertex

Roots (zeros) =  $y=0$  → the Place(s)  
where the function either touches  
or crosses the "x" axis

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Binomial Multiplication

~~Quadratic Multiplication~~

Quadratic Functions

Distribute property:

Examples:

$$3(4x+3)$$
$$(12x+9)$$

$$3x(x^2+2x+3)$$
$$(3x^3+6x^2+9x)$$

Monomial: 1 term

Examples:

$$(2x^2)$$

$$(3x)$$

Trinomial: 3 term

Examples:

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

Binomial: 2 term

Examples:

$$(2x+1)$$

## Binomial Multiplication

$$\text{multiply} \rightarrow (x-3)^2$$

$$\text{combine} \rightarrow x^2 - 3x - 3x + 9$$

$$x^2 - 6x + 9$$

multiply  
everything  
by everything

example:

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

$$x^3 + 2x^2 + x - 3x^2 - 6x - 3$$

$$x^3 - x^2 - 5x - 3$$

example:

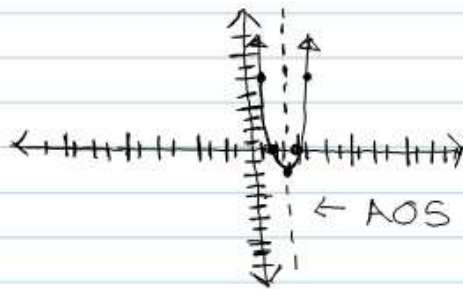
$$(x+5)(x-2)$$

$$x^2 - 2x + 5x - 10$$

$$x^2 + 3x - 10$$

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

vertex form



important

$$\text{AOS} \rightarrow x = \frac{-b}{2a}$$

Standard Form

$$F(x) = ax^2 + bx + c$$

$\downarrow$                        $\downarrow$                        $\downarrow$   
 quadratic term    linear term    constant term

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

~~2(x-3)~~

$$2(x-3)(x-3) - 2$$

$$2(x^2 - 3x - 3x + 9) - 2$$

$-6x$

$$2x^2 - 12x + 18 - 2$$

$$F(x) = 2x^2 - 12x + 16$$

Graph Standard Form

$$F(x) = ax^2 + bx + c$$

How to Find X

AOS  $\rightarrow x = \frac{-b}{2a}$  ← solve

How to find y  
Substitute AOS in standard Formula

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## Quadratic Equations

1.  $f(x) = x^2 - 4x - 3$

Find AOS

$$\text{AOS} - x = \frac{-b}{2a}$$

$$\text{AOS} - x = \frac{-(-4)}{2(1)}$$

$$\text{AOS} - x = \frac{4}{2}$$

$$\text{AOS} - x = 2$$

2. Find AOS  
vertex  
Then Graph

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

$$\text{AOS} - x = \frac{-b}{2a}$$

$$\text{AOS} - x = \frac{-(-3)}{2(1)}$$

$$\text{AOS} - x = \frac{3}{2} = 1\frac{1}{2} = 1.5$$

Substitute

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

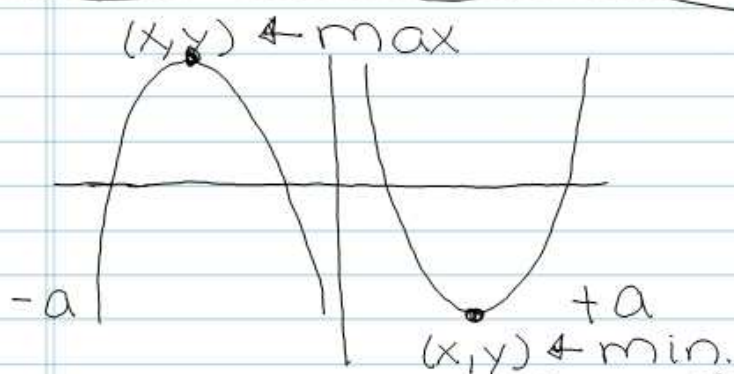
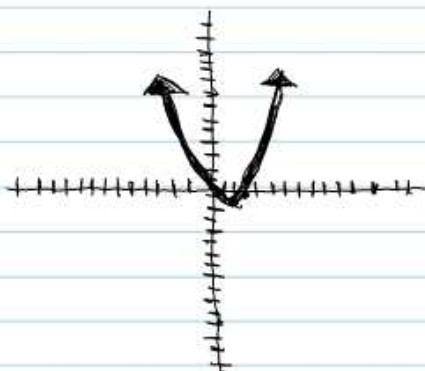
$$f(x) = x^2 - 3x + 1$$

$$f(x) = 1.5^2 - 3(1.5) + 1$$

$$f(x) = -1.25$$

vertex (vertex = (1.5, -1.25))

Graph



max value - y value

$$f(x) = -2x^2 + 8x - 7$$

$$AOS - x = \frac{-b}{2a}$$

$$AOS - x = \frac{-8}{2(-2)}$$

$$AOS - x = 2$$

Substitute

$$f(x) = -2x^2 + 8x - 7$$

$$f(x) = -2(2)^2 + 8(2) - 7$$

$$f(x) = -2(4) + 16 - 7$$

$$f(x) = 1$$

max  
value =  
y = 1