

Warm Up

Write an equation in each form and give the important information.

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

opens up y-intercept

$$y = 3(x-4)(x+1)$$

opens up x-intercepts are 4 and -1

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

opens down vertex (1,5) max value of 5

Axis of symmetry $x = 1$

Forms of a Quadratic Equation

Lesson objectives

- I know how to switch an equation from Factored to Standard Form
- I know how to switch an equation from Vertex to Standard Form
- I know how to switch an equation from Standard to Vertex Form

1.1

Lesson objectives

Teachers' notes

Lesson notes

Nelson Page 558 #s 1 & 2f plus extras at the end

Factored to Standard Form

To convert from factored to standard form we must expand the binomials.

Expand the following expressions

$$\text{a) } 3(x + 2)$$

$$= 3x + 6$$

$$\text{b) } 2x(x + 1)$$

$$= 2x^2 + 2x$$

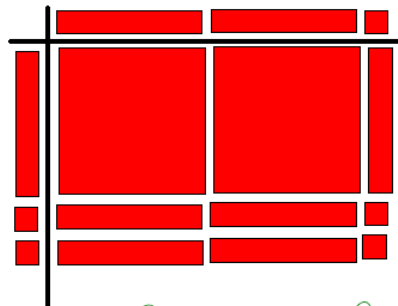
$$\text{c) } 3x(2x - 4)$$

$$= 6x^2 - 12x$$



How to Expand Binomials

$$\text{a) } (x + 2)(2x + 1)$$



$$2x^2 + 5x + 2$$

$$\begin{aligned} & (x+2)(2x+1) \\ &= 2x^2 + x + 4x + 2 \\ &= 2x^2 + 5x + 2 \end{aligned}$$

	$2x$	1
x	$2x^2$	x
2	$4x$	2



How to Expand Binomials

b) $(x - 2)(2x + 1)$

$2x^2 - 3x - 2$

$(x-2)(2x+1)$
 $= 2x^2 + x - 4x - 2$
 $= 2x^2 - 3x - 2$

Expand the following expressions

a) $(x + 1)(x + 2)$ b) $(2x - 1)(x + 1)$ c) $(3x + 1)(2x - 4)$

$$= x^2 + 2x + x + 2$$

$$= x^2 + 3x + 2$$

$$= 6x^2 - 12x + 2x - 4$$

$$= 6x^2 - 10x - 4$$

	$2x$	-1
x	$2x^2$	$-x$
1	$2x$	-1

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

Vertex to Standard Form

To convert from vertex to standard form we need to expand and simplify.

Expand the following expressions

a) $(x + 2)^2 + 1$ b) $2(x + 1)^2 - 2$ c) $-(x - 2)^2 + 4$

$$\begin{aligned} &= (x+2)(x+2)+1 &= 2(x+1)(x+1)-2 \\ &= x^2+2x+2x+4+1 &= 2(x^2+x+x+1)-2 \\ &= x^2+4x+5 &= 2(x^2+2x+1)-2 \\ & &= 2x^2+4x+2-2 \\ & &= 2x^2+4x \end{aligned}$$

$$\begin{aligned} \text{c) } &-(x-2)(x-2)+4 \\ &= -(x^2-2x-2x+4)+4 &= -x^2+4x-4+4 \\ &= -(x^2-4x+4)+4 &= -x^2+4x \end{aligned}$$

Standard Form to Vertex Form

The most common way to convert from standard form to vertex form is completing the square.

1. Factor the "a" value from the first two terms.
2. Divide the coefficient of the second term by 2 and square that number. This value is then added and subtracted in the bracket.
3. Remove the 'subtracted' value from the bracket and multiply it by "a".
4. Factor the trinomial in the bracket - it is a perfect square.
5. Simplify the two values outside the brackets.



Examples: Complete the Square

a) $y = 2x^2 + 8x - 3$

b) $y = -3x^2 - 6x + 1$

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

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

$$= 2(x^2 + 4x + (2)^2) - \underbrace{(2)(2)}_{\substack{\text{"a"} \\ \text{subtracted} \\ \text{term}}} - 3$$

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

$$= 2(x+2)^2 - 11$$

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

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

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

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

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

$$= -3(x+1)^2 + 4$$

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

$$= 2(x^2 - \frac{3}{2}x) - 8$$

$$= 2(x^2 - \frac{3}{2}x + (\frac{-3}{4})^2 - (\frac{-3}{4})^2) - 8$$

$$= 2(x^2 - \frac{3}{2}x + (\frac{-3}{4})^2) - (2)(\frac{-3}{4})^2 - 8$$

$$= 2(x - \frac{3}{4})^2 - \frac{9}{8} - 8$$

$$= 2(x - \frac{3}{4})^2 - 9\frac{1}{8}$$

Bonus HW Questions!
(Complete the Square)

3) $y = 2x^2 + 3x - 9$

4) $y = -3x^2 - 12x + 4$