

Expand and simplify OR Factor

You need to have these two skills to be prepared for the next section.

1) $(x+1)(x-4)$ $= x^2 - 4x + x - 4$ $= x^2 - 3x - 4$	2) $(x+3)(x+2)$ $= x^2 + 2x + 3x + 6$ $= x^2 + 5x + 6$	3) $(x-1)(x-5)$ $= x^2 - 5x - 1x + 5$ $= x^2 - 6x + 5$	4) $(2x+1)(3x-2)$ $= 6x^2 - 4x + 3x - 2$ $= 6x^2 - x - 2$
5) $(3x-1)(2x-3)$ $= 6x^2 - 9x - 2x + 3$ $= 6x^2 - 11x + 3$	6) $(x+5)(4x-1)$ $= 4x^2 - x + 20x - 5$ $= 4x^2 + 19x - 5$	7) $(2x+5)(2x-5)$ $= 4x^2 - 10x + 10x - 25$ $= 4x^2 - 25$	8) $(2x-5)^2$ $= 4x^2 - 20x + 25$
9) $(x-1)^2$ $= x^2 - 2x + 1$	10) $(3x+2)^2$ $= 9x^2 + 12x + 4$	11) $(2x+7)(x-2) + (3x+2)^2$ $= 2x^2 - 4x + 7x - 14 + 9x^2 + 12x + 4$ $= 11x^2 + 15x - 10$	12) $(5x-2)(5x+2) - (x-3)^2$ $= 25x^2 - 4 - (x^2 - 6x + 9)$ $= 25x^2 - 4 - x^2 + 6x - 9$ $= 24x^2 + 6x - 13$
13) $4x^5 - 10x^2 + 7x$ $= x(4x^4 - 10x + 7)$	14) $16x^3 - 8x^2$ $= 8x^2(2x-1)$	15) $4x^2 - 9$ $= (2x-3)(2x+3)$	16) $2x^2 - 18$ $= 2(x^2 - 9)$ $= 2(x-3)(x+3)$
17) $25x^2 - 30x + 9$ $= (5x-3)^2$	18) $2x^2 - 12x + 18$ $= 2(x^2 - 6x + 9)$ $= 2(x-3)^2$	19) $x^2 - 2x - 35$ $= (x-7)(x+5)$	20) $x^2 + 7x + 12$ $= (x+3)(x+4)$
21) $x^2 - 17x + 16$ $= (x-16)(x-1)$	22) $2x^2 + 13x - 6$ $= (2x-1)(x+6)$ NP	23) $12x^2 + 13x + 3$ $= (4x+3)(3x+1)$	24) $15x^2 - 13x + 2$ $= (3x-2)(5x-1)$
25) $40x^2 + 47x + 12$ $= (8x+3)(5x+4)$	26) $12x^2 + 59x - 5$ $= (12x-1)(x+5)$	27) $(4x-7)(4x+7) + (2x+5)^2$ $= 16x^2 - 49 + 4x^2 + 20x + 25$ $= 20x^2 + 20x - 24$	28) $(2x+5)(4x-1) - (2x+3)^2$ $= 8x^2 - 2x + 20x - 5 - [4x^2 + 12x + 9]$ $= 8x^2 + 18x - 5 - 4x^2 - 12x - 9$ $= 4x^2 + 6x - 14$

ANSWERS

Use the answers to check your work. If you get one incorrect, go back and find that mistake!

1) $x^2 - 3x - 4$	2) $x^2 + 5x + 6$	3) $x^2 - 6x + 5$	4) $6x^2 - x - 2$
5) $6x^2 - 11x + 3$	6) $4x^2 + 19x - 5$	7) $4x^2 - 25$	8) $4x^2 - 20x + 25$
9) $x^2 - 2x + 1$	10) $9x^2 + 12x + 4$	11) $11x^2 + 15x - 10$	12) $24x^2 + 6x - 13$
13) $x(4x^4 - 10x + 7)$	14) $8x^2(2x - 1)$	15) $(2x - 3)(2x + 3)$	16) $2(x - 3)(x + 3)$
17) $(5x - 3)^2$	18) $2(x - 3)^2$	19) $(x - 7)(x + 5)$	20) $(x + 3)(x + 4)$
21) $(x - 16)(x - 1)$	22) DNF	23) $(4x + 3)(3x + 1)$	24) $(3x - 2)(5x - 1)$
25) $(8x + 3)(5x + 4)$	26) $(12x - 1)(x + 5)$	27) $20x^2 + 20x - 24$	28) $4x^2 + 6x - 14$

Warm Up:

- Use the DESMOS to graph the parabola. Just provide a sketch on the paper, showing the zeros.
- Use the graph to determine the zeros.
- Factor the equation according to the type of expression (common, simple, tricky, difference of squares).

Standard Equation	Graph	Zeros/Solutions/ X-Intercepts	Factored Equation
$y = x^2 - 8x + 12$		6, 2 or (6, 0) (2, 0)	$y = (x-6)(x-2)$
$y = x^2 - 49$		$x = -7$ $x = 7$	$y = (x-7)(x+7)$
$y = x^2 + 3x$		$x = 0, -3$ or (0, 0) (-3, 0)	$y = x(x+3)$
$y = 2x^2 + 5x - 3$		$x = \frac{1}{2}, -3$ or $(\frac{1}{2}, 0) (-3, 0)$	$y = (2x-1)(x+3)$

What is the relationship between the zeros/solutions/x-intercepts and the factors?

opposite integer of set each bracket = 0 then solve.

- Hint:
- if the factor was $(x-6)$, what would the corresponding zero be? 6
 - if the factor was $(x+4)$, what would the corresponding zero be? -4
 - if the factor was x , what would the corresponding zero be? 0
 - if the factor was $(2x-3)$, what would the corresponding zero be? $\frac{3}{2}$

Day 1: Factored Form

We have already seen two different forms of the equation of a quadratic relation:

1. Standard form $y = ax^2 + bx + c$
2. Vertex form $y = a(x-h)^2 + k$

We will now investigate the third form called: FACTORED FORM

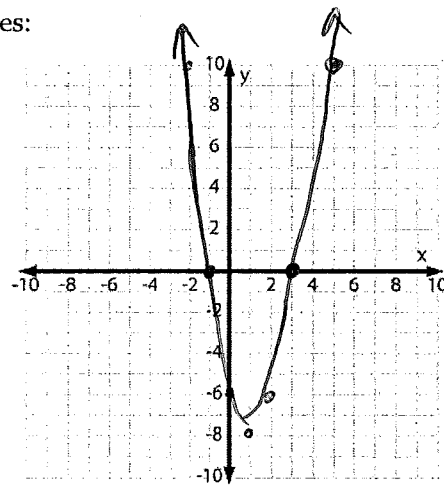
$$y = a(x-r)(x-s)$$

Graph the following quadratic relation using a table of values:

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

x	y
-3	24
-2	10
-1	0
0	-6
1	-8
2	-6
3	0
4	12

$$y = 2(-3+1)(-3-3) = 24$$



Locate the x-intercepts. What do you notice about the x-intercepts and the equation of the quadratic relation?

x-intercepts are -1 and 3
 The factors are $(x+1)$ and $(x-3)$

Why is this true?

To solve for x-intercepts, we set factor $= 0$ and solve! Refer to eg. $(x+1) = 0$
 $x = -1$

If $ab = 0$, then either $a = 0$ or $b = 0$

If $(a+b)(c+d) = 0$, then _____

A quadratic equation in the form $y = a(x-r)(x-s)$ gives us the x-intercepts.

The x-intercepts are also known as: roots or zeros.

1. State the x-intercepts of each of the following:

a) $y = -4(x-2)(x+6)$

$x = 2$ or $x = -6$

b) $y = \frac{2}{5}(x+3)(x-8)$

$x = -3$ or 8

c) $y = 3x(2x-1)$

$x = 0$ or $\frac{1}{2}$

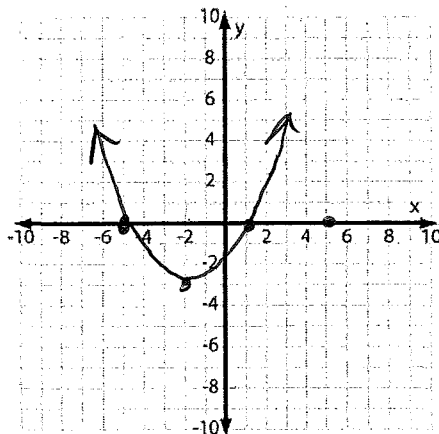
2. Graph the following quadratic relation:

a) $y = \frac{1}{3}(x-1)(x+5)$

OR Zeros: $x = 1, -5$

$x_v = \frac{1 + (-5)}{2} = -2$

$y_v = \frac{1}{3}(-2-1)(-2+5)$
 $= \frac{1}{3}(-3)(3) = -3$
 $= \frac{1}{3}(-3)(3)$



x	y
-6	7/3
-5	0
-4	-5/3
-3	-8/3
-2	-3
-1	-8/3
0	-5/3
1	0
2	7/3

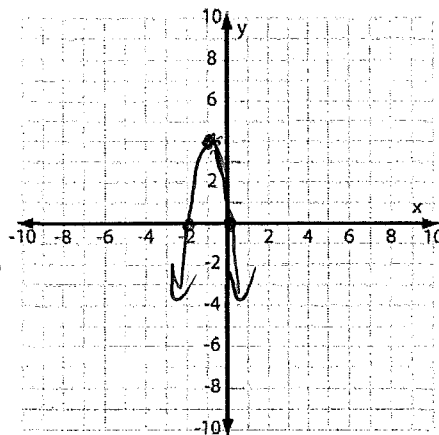
b) $y = -4x(x+2)$

OR Zeros: $x = 0, -2$

$x_v = \frac{0 + (-2)}{2} = -1$

$y_v = -4(-1)(-1+2) = 4$

x	y
-3	-12
-2	0
-1	4
0	0
1	-12
2	-32
3	-60



Seatwork: p.192 #1-3, 5-7