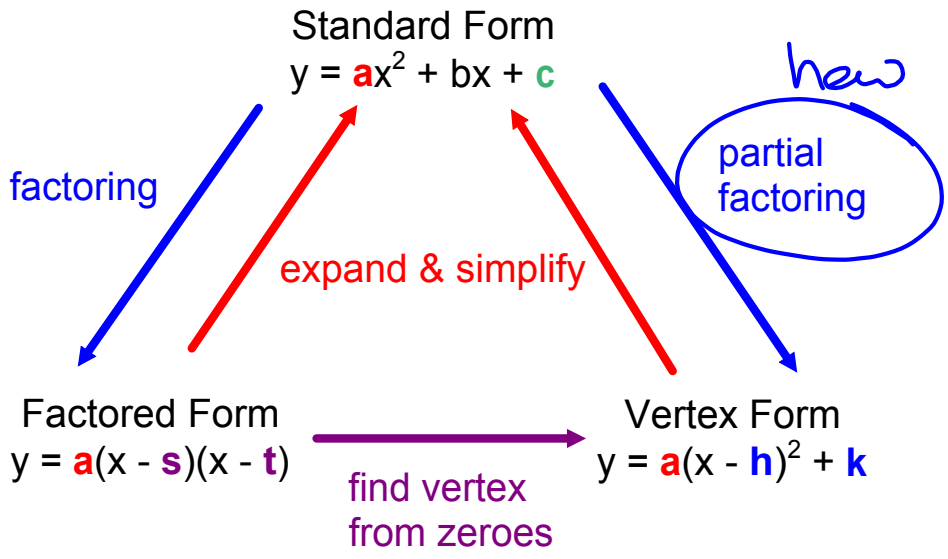
Relating Three Forms of a Quadratic Equation

Apr. 19/2016



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Ex.1 Expand & simplify each equation to obtain the standard form equation.

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

	x	$+5$
x	x^2	$5x$
-1	$-x$	-5

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

$= 2(x^2 + 4x - 5)$

$= 2x^2 + 8x - 10$

(b) $y = -0.5(x - 4)^2 + 3$

$= -0.5(x-4)(x-4) + 3$

$= -0.5(x^2 - 4x - 4x + 16) + 3$

$= -0.5(x^2 - 8x + 16) + 3$

$= -0.5x^2 + 4x - 8 + 3$

$= -0.5x^2 + 4x - 5$

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Ex.2 Write $y = x^2 - 4x + 3$ in factored form and vertex form.

$a = 1$

S: -4
P: 3
I: $-1, -3$

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

$a = 1$

$a = 1$
$h = 2$
$k = -1$

zeroes: $1, 3$

$x_v = \frac{1+3}{2}$
$= 2$

sub $x = 2$

$y_v = (2-1)(2-3)$
$= (1)(-1)$
$= -1$

$V(2, -1)$

$y = a(x-h)^2 + k$
$y = (x-2)^2 - 1$

Apr 15-10:32 AM

Ex: Determine the vertex, and the vertex form, of
$y = x^2 - 12x + 5$

S: -12 cannot be factored
P: 5
I: ✗

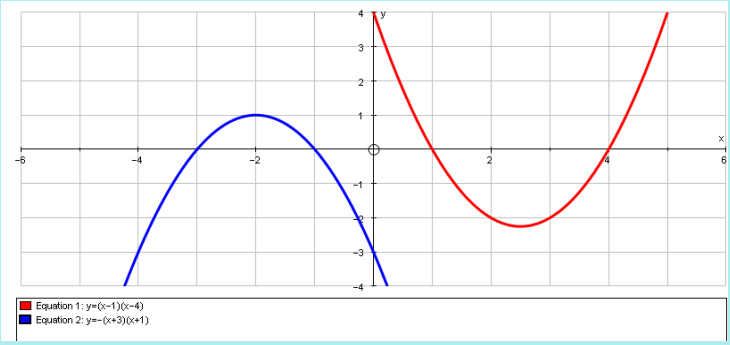
$-1, -5$

$5, 1$

Apr 15-10:43 AM

If the parabola crosses the x-axis, the x-coordinates of the crossing points are called the zeroes, or roots, or x-intercepts.

A parabola may have two zeros:



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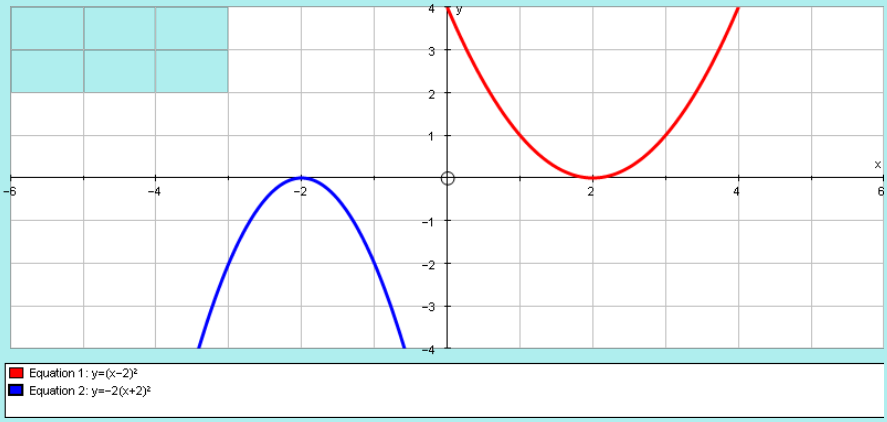
Or one zero:



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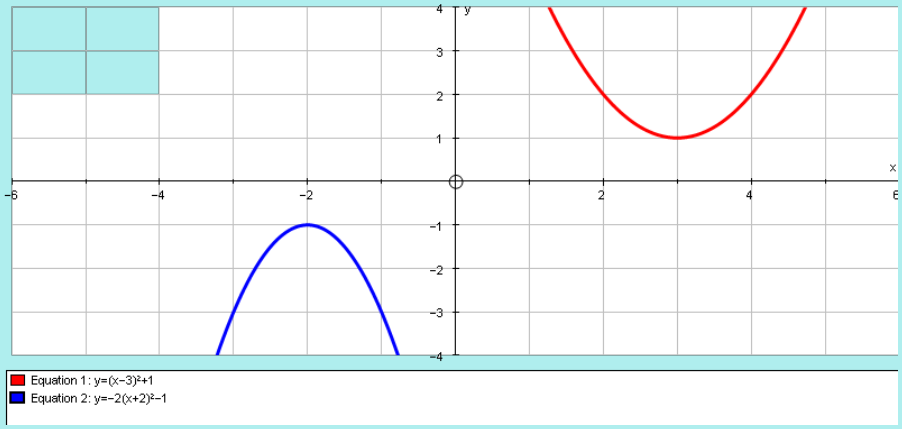
Or no zeroes:



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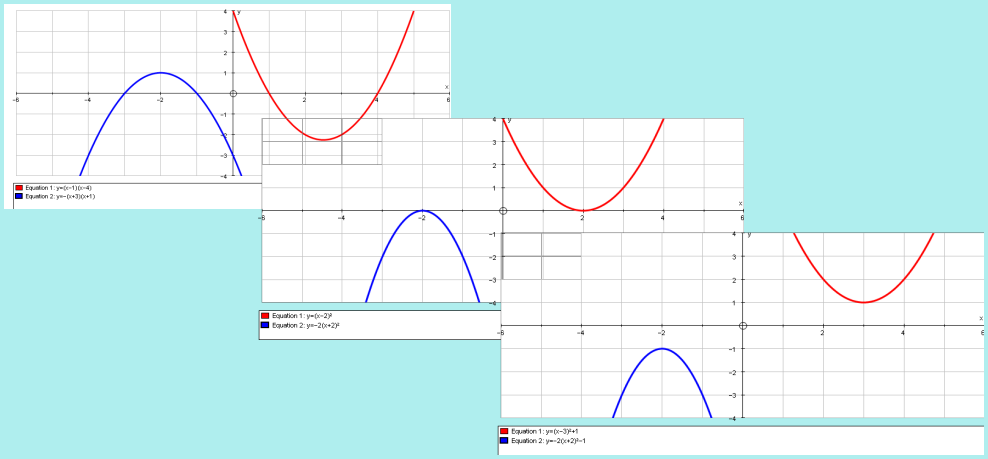
Recall:

(1) Factored form indicates the zeroes of the quadratic relation.

(2) A quadratic relation can have 0, 1, or 2 zeroes.



Nov 20-8:17 PM

Not all quadratics have zeroes, which means they cannot be factored. Instead, use symmetry to perform a partial factoring.

1) Determine two points that have the same y-value.
   - start with a point that is given and then find the matching point with the same y-value
   - the y-intercept is usually a good choice

2) Find the x-value of the vertex (h) using symmetry

3) Find the y-value of the vertex (k) by subbing h into the original equation.

Assigned Work:

p.293 # 4c, 5ac, 6ac, 9ac, 10ac
p.301 # 4, 5acef, 7ace

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Ex.3 Determine the vertex, and the vertex form, of $y = x^2 - 12x + 5$

S: -12
P: 5
I: ✗
-1, -5
5, 1

cannot be factored → y-int: (0, 5)

matching point (symmetric): (x, 5)

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

partial factor

$y = x(x-12) + 5$

what values of x give y = 5?

$x = 0$ or $x - 12 = 0$

$x = 12$ → matching point (12, 5)

$x_v = \frac{0+12}{2}$

$= 6$

Sub $x = 6$

$y_v = (6)^2 - 12(6) + 5$

$= 36 - 72 + 5$

$= -31$

$V(6, -31)$

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

1 6 -31

$y = (x-6)^2 - 31$

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Ex. 4 Determine the vertex, and the vertex form, of
$y = -3x^2 + 15x + 2$

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Assigned Work:

p.293 # 4c, 5ac, 6ac, 9ac, 10ac
p.301 # 4, 5acef, 7ace

b

p.293 6c

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

$y = -1(x^2 - 8x + 16) + 4$

$y = -x^2 + 8x - 16 + 4$

$y = -x^2 + 8x - 12$

$y = -1(x^2 - 8x + 12)$

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p.293 9(c)

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

$(x+5)(x+5)$

$= x^2 + 10x + 25$

$= -(x^2 + 10x + 25) + 1$

$= -x^2 - 10x - 25 + 1$

$= -x^2 - 10x - 24$

$= -1(x^2 + 10x + 24)$

S 10
P 24
I 6, 4

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10(c) $y = 2x^2 - x - 6$

$= 2x^2 - 4x + 3x - 6$

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

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

S -1
P -12
I -4, 3

Set $y = 0$

$0 = (x-2)(2x+3)$

$x - 2 = 0$

$x = 2$

$2x + 3 = 0$

$2x = -3$

$x = -\frac{3}{2}$

$x = -1.5$

$x_v = \frac{2 + (-\frac{3}{2})}{2}$

$= \frac{\frac{4}{2} - \frac{3}{2}}{2}$

$= \frac{\frac{1}{2}}{2}$

$= \frac{1}{4}$

$y_v = (\frac{1}{4} - 2)(2(\frac{1}{4}) + 3)$

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p. 301 #4(b)

(3,0), (7,0), (9,-24)

$x_v = \frac{3+7}{2}$

$= \frac{10}{2}$

$= 5$

$y = a(x-5)^2 + k$

(3,0): $0 = a(3-5)^2 + k$

$0 = 4a + k$

(7,0): $0 = a(7-5)^2 + k$

$0 = 4a + k$ ①

(9,-24): $-24 = a(9-5)^2 + k$

$-24 = 16a + k$ ②

① $0 = 4a + k$

② - ①: $\frac{-24}{12} = \frac{12a}{12}$

$a = -2$

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5(c) $y = -2(x+3)(x-7)$

(i) zeroes: (-3,0) and (7,0)

(ii) $x = \frac{-3+7}{2}$

$= \frac{4}{2}$

A.of S.

$x = 2$

(iii) sub $x = 2$: $y = -2(2+3)(2-7)$

$= -2(5)(-5)$

$= 50$

V(2,50)

$y = -2(x-2)^2 + 50$

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5(e) $y = x^2 + 5x$

$y = x(x+5)$

Zeroes: $(0,0)$ and $(5,0)$

$x_v = \frac{0+5}{2}$

$= \frac{5}{2}$

$= 2.5$

$y_v = \frac{5}{2}\left(\frac{5}{2}+5\right)$

$= \frac{5}{2}\left(\frac{5}{2}+\frac{10}{2}\right)$

$= \frac{5}{2}\left(\frac{15}{2}\right)$

$= \frac{75}{4}$

$V\left(\frac{5}{2}, \frac{75}{2}\right)$

OR

$V(2.5, 18.75)$

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