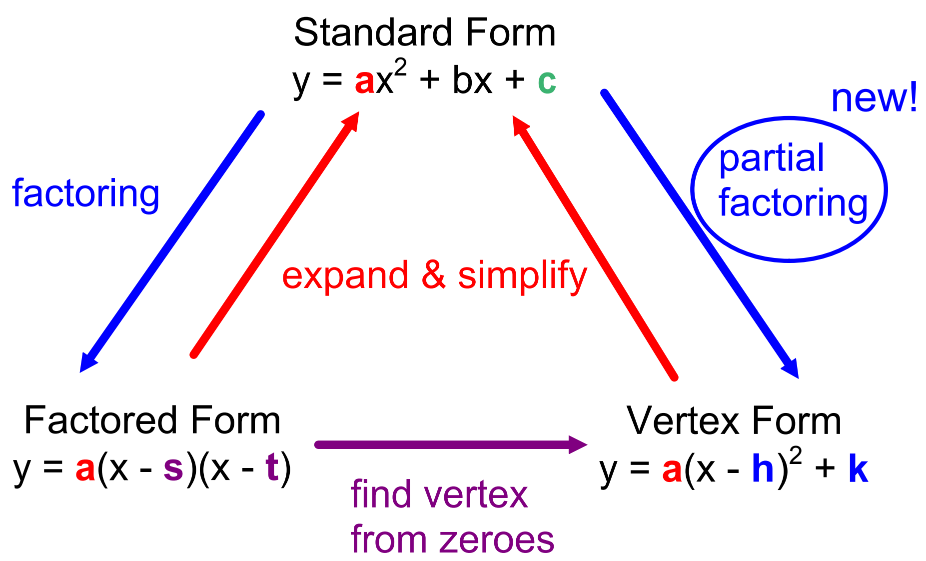
Relating Three Forms of a Quadratic Equation

Apr. 19/2016



Apr 12-2:18 PM

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

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

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

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

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

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

$= -0.5\underbrace{(x-4)(x-4)} + 3$

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

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

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

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

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Ex.2 Write $y = \cancel{1}x^2 - 4x + 3$ in factored form and vertex form.

$y = ax^2 + bx + c$

S -4
P $(1)(3) = 3$
I $-1, -3$

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

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

zeroes: 1, 3

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

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

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

know $a = 1$ $\longrightarrow$ $y = (x-2)^2 - 1$

Apr 15-10:32 AM

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

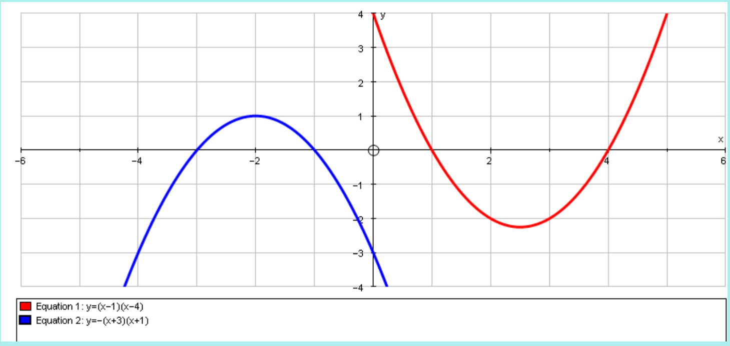
S -12
P 5
I $\cancel{}$

$-1, -5$
$5, 1$

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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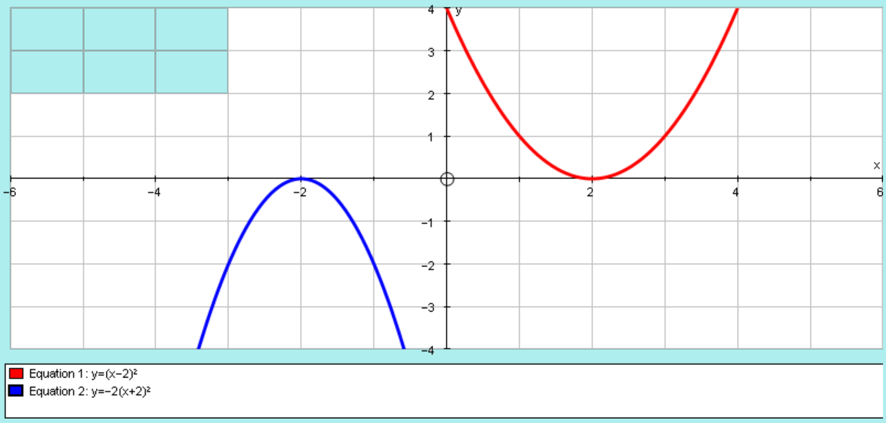
Or one zero:



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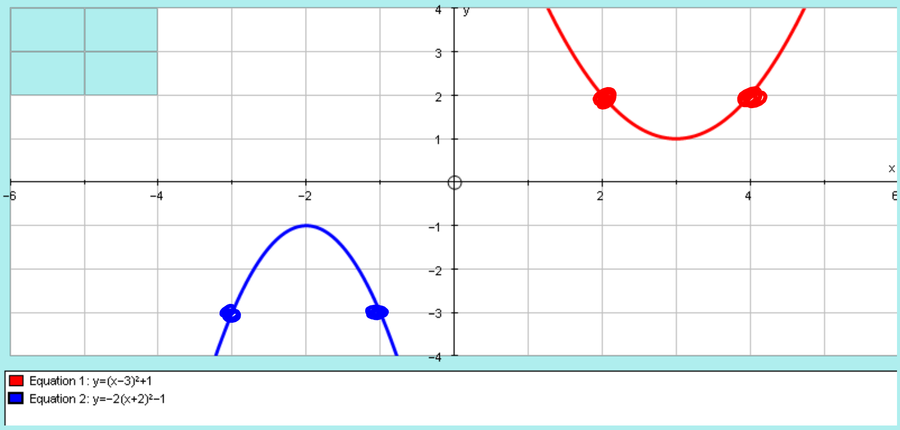
Or no zeroes:



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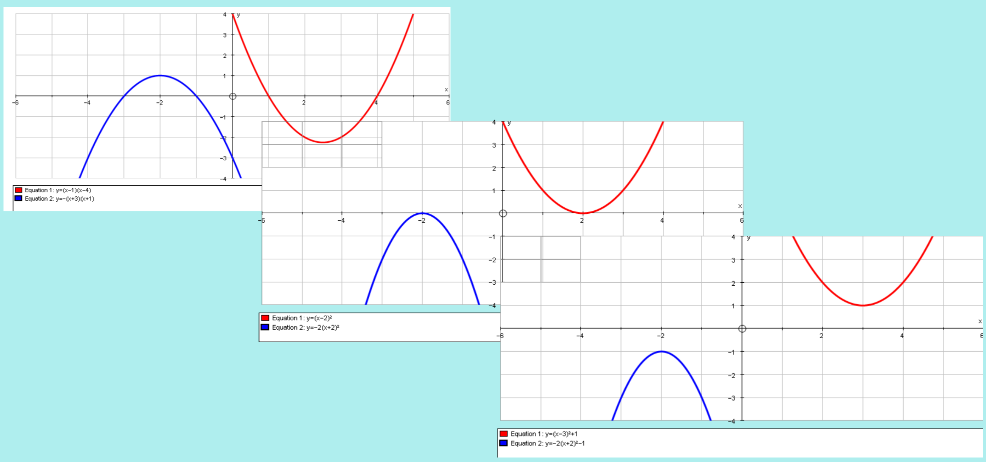
Recall:

(1) Factored form indicates the <u>zeroes</u> 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.

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

y-int : $(0, 5)$

matching point : $(\underset{?}{x}, 5)$

$y = \underbrace{x(x-12) + 5}$

how can we make this equal to 5?

make $x(x-12) = 0$

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

$x = 12$

matching point $(12, 5)$

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

$= 6$

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

$= 36 - 72 + 5$

$= -31$

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

$y = 1(x-6)^2 - 31$

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

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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

p.293 5(a) $V(-1,-4)$

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

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

sub $(1,0)$

$0 = a(1+1)^2 - 4$

$0 = 4a - 4$

$4 = 4a$

$a = 1$

Apr 15-12:08 PM

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

$y=-\underbrace{(x+5)(x+5)}+1$

$y=-(x^2+5x+5x+25)+1$

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

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

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

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

$=-1(\qquad)$

S 10
P 24
I 6, 4

Apr 20-2:04 PM

10 (a) $y=2x^2-12x$

$y=2x(x-6)$

zeroes: 0, 6

$x_v=\frac{0+6}{2}$

$=3$

$y_v=2(3)(3-6)$

$=6(-3)$

$=-18$

$y=2(x-3)^2-18$

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p. 293
10 (c) $y = 2x^2 - x - 6$

S −1
P −12
I −4, 3

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

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

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

Set $y = 0$

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

$x - 2 = 0$
$x = 2$

$2x + 3 = 0$
$2x = -3$
$x = \frac{-3}{2}$

$x = -1.5$

$x_v = \frac{2 + (-1.5)}{2}$

$= \frac{0.5}{2}$

$= 0.25$

$y_v = (0.25 - 2)(2(0.25) + 3)$

$= (-1.75)(3.5)$

$= -6.125$

$V(0.25, -6.125)$

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p. 301 #4 $(3,0)$ $(7,0)$ $(9,-24)$

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

$= 5$

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

$y = \underset{?}{a}(x-5)^2 + \underset{?}{k}$

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

$0 = 4a + k$ ①

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

$0 = 4a + k$ ①

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

$-24 = 16a + k$ ②

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p. 301

7(e) $y = \underbrace{-\frac{1}{2}x^2 + 2x}_{} - 3$

y-int: $(0, -3)$

matching: $(4, -3)$

$y = \underbrace{-\frac{1}{2}x(x-4)}_{} - 3$

$x = 0$ $x = 4$

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