PC

Complete the Square

$\boxed{a=1}$

Steps

1. move everything to one side
2. find b
3. $(b/2)^2$ & add & subtract from the equation to balance the equation
4. factor $(x+b/2)^2$ & combine the #s
5. solve for x

$\boxed{ex}$

$10 = x^2 - 4x + 9$

1. $0 = x^2 - 4x - 1$
2. $b = -4$
3. $(b/2)^2 = (-4/2)^2 = 4$

   $0 = (x^2 - 4x + \underline{4}) - \underline{4} - 1$
4. $0 = (x-2)^2 - 5$
5. $5 = (x-2)^2$

   $\pm\sqrt{5} = x-2$

   $\boxed{2 \pm \sqrt{5} = x}$

$\boxed{a \neq 1}$

1. move everything to one side
2. divide a value out of x^2 & x
3. find b
4. $(b/2)^2$ & add to the equation then subtract $a \cdot (b/2)^2$
5. factor $(x+b/2)^2$ & combine #s
6. solve

$\boxed{ex2}$

$15 = 2x^2 + 8x + 4$

1. $0 = 2x^2 + 8x - 11$
2. $0 = 2(x^2 + 4x + __) - __ - 11$
3. $b = 4$
4. $0 = 2(x^2 + 4x + \underline{4}) - \underline{8} - 11$
5. $0 = 2(x+2)^2 - 19$
6. $19 = 2(x+2)^2$

   $\frac{19}{2} = (x+2)^2$

   $\frac{\pm\sqrt{19}}{\sqrt{2}} = x+2$

   $-2 \pm \frac{\sqrt{19}}{\sqrt{2}} = x$

   $\boxed{-2 \pm \frac{\sqrt{38}}{2} = x}$

applications

- completing the square shows the vertex.

$\boxed{\text{Ex}}$ $f(x) = x^2 - 6x - 10$

y-intercept $(0,-10)$

$f(x) = (x^2 - 6x + 9) - 10 - 9$

$f(x) = (x-3)^2 - 19$

vertex $(3,-19)$

axis of symmetry : $x = 3$

where the parabola could be folded in half.

general equation

$f(x) = (x-h)^2 + k$

vertex (h,k)

discriminant

- tells how many roots a parabola has

$D > 0$ two real roots

$D = 0$ one real root

$D < 0$ no real roots