

Completing the Square Keypoints

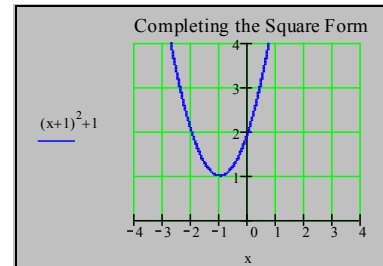
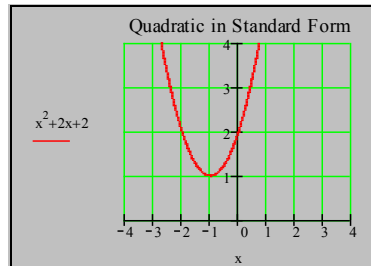
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For a given quadratic of the form:-

$$ax^2 + bx + c$$

We can express it in the form

$$a \cdot (x + e)^2 + d$$



This helps us to easily sketch the graph of the function and pick out the important feature of the function.

Method of completing the square:-

Step 1 Put the quadratic into the standard form.

$$ax^2 + bx + c$$

Step 2 Take out (a) as a common factor.

$$a \cdot \left(x^2 + \frac{b}{a} \cdot x + \frac{c}{a} \right)$$

Step 3 Half the term in x and then write as a square termed term with plus or minus constant term so that you keep the equation balanced. (You can check the left and right sides are equal by multiplying out the right side of the equation!)

$$x^2 + \frac{b}{a} \cdot x = \left(x + \frac{b}{2a} \right)^2 - \frac{b^2}{4 \cdot a^2}$$

Step 4 Write out revised equation.

$$a \cdot \left(x^2 + \frac{b}{a} \cdot x + \frac{c}{a} \right) = a \cdot \left[\left(x + \frac{b}{2a} \right)^2 + \frac{c}{a} - \frac{b^2}{4 \cdot a^2} \right]$$

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Step 5 Let

$$e = \frac{b}{2a} \qquad d = \frac{c}{a} - \frac{b^2}{4 \cdot a^2}$$

Finally rewrite equation.

$$a \cdot (x + e)^2 + d$$

Hope you can now see that you can go from step 1 to step 5 and miss out steps 2, 3, 4 if you can remember the equations in step 5. !!