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The normal method of teaching the quadratic is to equate the dependent variable term equal to zero and use (3) terms, if we add a 4th D term (dependent variable) to the equation the step of equating the dependent variable term to zero is no longer required. The following procedure “the extended quadratic” will not be found in any textbook nor is it ever taught or used this way.

Example:

$$\left(5\cdot X^2\right) + 3\cdot X - 2 = 46$$

First the normal way as it is taught today.
equating the last term to zero =

$$\left(5\cdot X^2\right) + 3\cdot X - 48 = 0$$

APPLYING THE Normal QUADRATIC equation:

$$X = \frac{-B + \sqrt{B^2 - 4\cdot A\cdot C}}{2\cdot A} \qquad X = \frac{-B - \sqrt{B^2 - 4\cdot A\cdot C}}{2\cdot A}$$

$$\frac{-3 + \sqrt{\left(3^2\right) - 4\cdot 5\cdot -48}}{2\cdot 5} = 2.813 \qquad \frac{-3 - \sqrt{\left(3^2\right) - 4\cdot 5\cdot -48}}{2\cdot 5} = -3.413$$

An extended quadratic could be taught as follows:

$$X = \begin{bmatrix} \frac{1}{(2\cdot A)}\cdot\left(-B + \sqrt{B^2 + 4\cdot A\cdot C + 4\cdot A\cdot D}\right) \\ \frac{1}{(2\cdot A)}\cdot\left(-B - \sqrt{B^2 + 4\cdot A\cdot C + 4\cdot A\cdot D}\right) \end{bmatrix}$$

$$\frac{1}{(2\cdot 5)}\cdot\left(-3 + \sqrt{3^2 - 4\cdot 5\cdot -2 + 4\cdot 5\cdot 46}\right) = 2.813$$

$$\frac{1}{(2\cdot 5)}\cdot\left(-3 - \sqrt{3^2 - 4\cdot 5\cdot -2 + 4\cdot 5\cdot 46}\right) = -3.413$$

The dependent variable now, need not be equated to zero and the procedure has been simplified. Although the formula is a little longer to commit to memory.

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Some other forms of the same modified or extended quadratic equation are:

$$\left[\begin{array}{l}\dfrac{1}{\left(2\cdot A^2\right)}\cdot\left[-B+\left(B^2-4\cdot A^2\cdot C+4\cdot A^2\cdot D\right)^{\left(\frac{1}{2}\right)}\right]\\ \dfrac{1}{\left(2\cdot A^2\right)}\cdot\left[-B-\left(B^2-4\cdot A^2\cdot C+4\cdot A^2\cdot D\right)^{\left(\frac{1}{2}\right)}\right]\end{array}\right]$$

$$\left[\begin{array}{l}X=-\left(\dfrac{B}{2\cdot A}\right)-\dfrac{1}{2}\cdot\dfrac{\sqrt{B^2-4\cdot A\cdot C+4\cdot A\cdot D}}{A}\\ X=\dfrac{1}{2}\cdot\dfrac{\sqrt{B^2-4\cdot A\cdot C+4\cdot A\cdot D}}{A}-\dfrac{B}{2\cdot A}\end{array}\right]$$

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