

Mathematics 10D

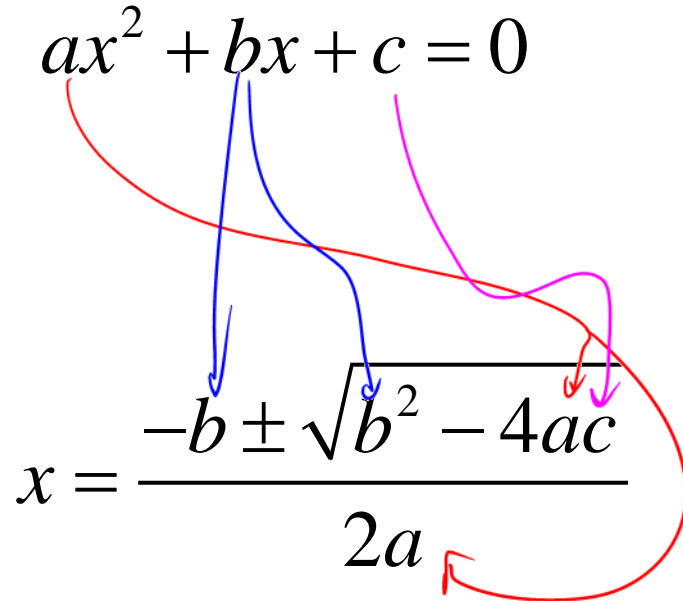
Q.08 – Solving By Quadratic Formula

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Mathematics 10D

Q.08 – Solving By Quadratic Formula

The quadratic formula is the formula that solves all. In order to use it, you need to setup the quadratic in standard form. The quadratic formula is derived by completing the square, then solving from the vertex form.

$$ax^2 + bx + c = 0$$


The diagram illustrates the correspondence between the coefficients of a quadratic equation and the quadratic formula. Colored arrows show the mapping: a blue arrow from a to $2a$, a blue arrow from b to $-b$, a blue arrow from b to b^2 , a red arrow from c to $-4ac$, and a red arrow from c to $-4ac$. A red arrow also points from the entire equation $ax^2 + bx + c = 0$ to the denominator $2a$.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Let's give it a try.

$$5x^2 + 12x - 32 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-12 \pm \sqrt{(12)^2 - 4(5)(-32)}}{2(5)}$$

$$x = \frac{-12 \pm \sqrt{144 + 640}}{10}$$

$$x = \frac{-12 \pm \sqrt{784}}{10}$$

$$x = \frac{-12 \pm 28}{10}$$

$$\oplus x = \frac{-12 + 28}{10}$$

$$x = \frac{16}{10}$$

$$x = 1.6$$

$$\ominus x = \frac{-12 - 28}{10}$$

$$x = \frac{-40}{10} = -4 = x$$

Give it another go.

$$5x^2 + 5x + 8 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(5)(8)}}{2(5)}$$

$$x = \frac{-5 \pm \sqrt{25 - 160}}{10}$$

$$x = \frac{-5 \pm \sqrt{-135}}{10}$$

cannot square root a negative

∴ No solutions!!

Have a coffee, have a tea, let's do example 3!

$$4x^2 - 10x - 18 = 6$$

$$4x^2 - 10x - 24 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{10 \pm \sqrt{10^2 - 4(4)(-24)}}{2(4)}$$

$$x = \frac{10 \pm \sqrt{484}}{8}$$

$$x = \frac{10 \pm 22}{8}$$

$$\oplus \quad x = \frac{10 + 22}{8}$$

$$x = 4$$

$$\ominus \quad x = \frac{10 - 22}{8}$$

$$x = -1.5$$

Are the answers always neat?

$$11x^2 + 7x - 20 = 6x + 8x^2$$

$$3x^2 + 1x - 20 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(3)(-20)}}{2(3)}$$

$$x = \frac{-1 \pm \sqrt{241}}{6}$$

$$x = \frac{-1 \pm 15.52}{6}$$

$$\textcircled{+} x = \frac{-1 + 15.52}{6}$$

$$x = 2.42$$

$$\textcircled{-} x = \frac{-1 - 15.52}{6}$$

$$x = -2.75$$

Question: What is the AoS?

$$h = \frac{2.42 + -2.75}{2} = -0.165$$

$$k = 3(-0.165)^2 + 1(-0.165) - 20$$

$$k = -20.08$$

\therefore Vertex is $(-0.165, -20.08)$