Mathematics 10D

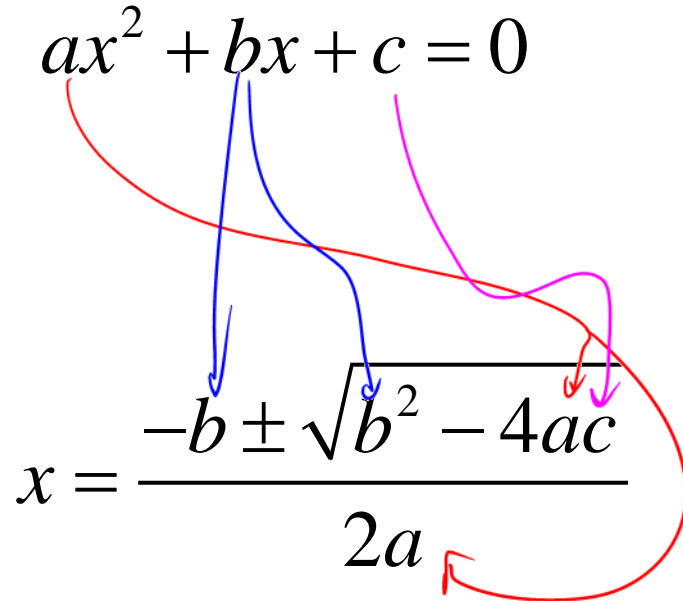## Q.08 – Solving By Quadratic Formula

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Mathematics 10D

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.

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

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

Let's give it a try.

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

a   b   c

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

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

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

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

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

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

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

$$\boxed{x = 1.6}$$

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

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

Give it another go.

$$\overset{a}{5}x^2 + \overset{b}{5}x + \overset{c}{8} = 0$$

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

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

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

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

→ cannot square root a negative

∴ No solutions!!

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

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

$$\overset{a}{4}x^2 - \overset{b}{10}x - \overset{c}{24} = 0$$

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

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

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

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

$\oplus$ $x = \dfrac{10 + 22}{8}$

$x = 4$

$\ominus$ $x = \dfrac{10 - 22}{8}$

$x = -1.5$

Are the answers always neat?

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

$$\overset{a}{3}x^2 + \overset{b}{1}x - \overset{c}{20} = 0$$

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

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

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

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

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

$$x = 2.42 \quad \checkmark$$

$$\ominus \quad x = \frac{-1 - 15.52}{6}$$

$$x = -2.75 \quad s$$

Question: What is the AoS?

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

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

$$k = -20.08$$

∴ Vertex is $(-0.165, -20.08)$