Complex numbers and quadratic equations

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

$$x_{1,2} = \frac{2 \pm \sqrt{4 - 4 \cdot 1 \cdot 3}}{2} = \frac{2 \pm \sqrt{-8}}{2} = \boxed{1 \pm i\sqrt{2}}$$

$x_1 = 1 + i\sqrt{2}$
$x_2 = 1 - i\sqrt{2}$
} always appear as conjugate pair

Solve:

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

$$x_{1,2} = \frac{-2 \pm \sqrt{4 - 4 \cdot 5}}{2} = \frac{-2 \pm \sqrt{-16}}{2} = \frac{-2 \pm 4i}{2} = \boxed{-1 \pm 2i}$$

$$(x+3)^2 + (x-1)^2 = 0$$

$$x^2 + 6x + 9 + x^2 - 2x + 1 = 0$$

$$2x^2 + 4x + 10 = 0$$

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

$$x_{1,2} = \frac{-2 \pm \sqrt{4 - 20}}{2} = \boxed{-1 \pm 2i}$$