

به نام او
ریاضی عمومی ۱
معادلات درجه ۲ و ۳

$$ax^r + bx + c = 0 \quad a \neq 0$$

$$x^r + b'x + c' = 0$$

$$x^r + d = 0 \Rightarrow x = \pm \sqrt[r]{-d}$$

$$x^r + b'x + c' = (x - \alpha)(x - \beta) \Rightarrow b' = -\alpha - \beta$$

$$y = x + \frac{b'}{r}$$

$$x^r + b'x + c' = (y - \frac{b'}{r})^r + b'(y - \frac{b'}{r}) + c'$$

$$= y^r - r y \frac{b'}{r} + (\frac{b'}{r})^r + b'y - \frac{b'^r}{r} + c'$$

$$= y^r + d$$

$$d = c' - \frac{b'^r}{r}$$

$$\Rightarrow y = \pm \sqrt[r]{\frac{b'^r}{r} - c'} \Rightarrow x = -\frac{b'}{r} \pm \sqrt[r]{\frac{b'^r}{r} - c'} \quad \Delta$$

$$x^r + ax^r + bx + c = 0$$

$$x + a/r = y$$

$$y^r + py + q = 0$$

$$y = u + v$$

$$(u+v)^r + p(u+v) + q = 0 \Rightarrow u^r + v^r + (ruv + p)(u+v) + q = 0$$

$$ruv = -p \Rightarrow u^r + v^r = -q/r$$

$$\Downarrow \quad ru^r v^r = -p^r/r \Rightarrow t^r + qt - p^r/r = 0$$

$$\Rightarrow u, v = \sqrt[r]{\frac{-q \pm \sqrt{q^2 - \frac{4p^r}{r}}}{2}}$$

$$y = \sqrt[r]{\frac{q}{r} + \sqrt{q^2/r - \frac{p^r}{r}}} + \sqrt[r]{\frac{q}{r} - \sqrt{q^2/r - \frac{p^r}{r}}}$$

دستور کاردانو

$$y = \sqrt[3]{\frac{q}{r} + \sqrt{\frac{q^2}{r^2} - \frac{p^2}{r^3}}} + \sqrt[3]{\frac{q}{r} - \sqrt{\frac{q^2}{r^2} - \frac{p^2}{r^3}}}$$

مقادیر $\sqrt[3]{\frac{q}{r}}$ ، $\sqrt[3]{\frac{q^2}{r^2}}$ ، $\sqrt[3]{\frac{p^2}{r^3}}$ صحیح

$$t^3 - 3t + 2 = (t-1)^2(t+2)$$

دستور کار $\rightarrow t = -2$

$$t^3 - 9t + 4 = (t-2)(t^2 + 2t - 2) \Rightarrow t = 2, -1 \pm \sqrt{3}$$

$$t = \sqrt[3]{\frac{1}{r}(-K + \sqrt{-4})} + \sqrt[3]{\frac{1}{r}(-K - \sqrt{-4})} = \sqrt[3]{-2 + 2\sqrt{-1}} + \sqrt[3]{-2 - 2\sqrt{-1}}$$

$$(1 + \sqrt{-1})^3 = 1 + 3\sqrt{-1} + 3 \times (-1) + (-1)\sqrt{-1} = -2 + 2\sqrt{-1}$$

$$(-1 - \sqrt{-1})^3 = -2 - 2\sqrt{-1}$$

$$t = 1 + \sqrt{-1} + 1 - \sqrt{-1} = 2$$