1) It helps to work in <u>reduced</u> variables.

2) If you have a cubiz of the form:

$$C_3 X^3 + C_2 X^2 + C_1 X + C_0 = 0$$

$$Q = \frac{C_2^2 - 3C_1}{9}, \quad R = \frac{2C_2^3 - 9C_1C_2 + 27C_0}{54}$$

if $Q^3 - R^2 \geq 0$ there are 3 roots, where

$$\theta = \cos^{-1}\left(R\,Q^{-3/2}\right)$$

$$X_1 = -2\sqrt{Q}\cos\left(\frac{\theta}{3}\right) - \frac{C_2}{3}$$

$$X_2 = -2\sqrt{Q}\cos\left(\frac{\theta+2\pi}{3}\right) - \frac{C_2}{3}$$

$$X_3 = -2\sqrt{Q}\cos\left(\frac{\theta+4\pi}{3}\right) - \frac{C_2}{3}$$