13. $x''_{tt} = \dfrac{1}{x^3} F\left(\dfrac{x}{\varphi(t)}, \dfrac{y}{\varphi(t)}\right), \quad y''_{tt} = \dfrac{1}{y^3} G\left(\dfrac{x}{\varphi(t)}, \dfrac{y}{\varphi(t)}\right), \quad \varphi(t) = \sqrt{at^2 + bt + c}.$

1°. The transformation

$$\tau = \int \frac{dt}{\varphi^2(t)}, \quad u = \frac{x}{\varphi(t)}, \quad v = \frac{y}{\varphi(t)}$$

leads to the autonomous system of equations

$$u''_{\tau\tau} + \left(ac - \tfrac{1}{4}b^2\right)u = u^{-3}F(u, v),$$
$$v''_{\tau\tau} + \left(ac - \tfrac{1}{4}b^2\right)v = v^{-3}G(u, v).$$

2°. Particular solutions:

$$x = A\sqrt{at^2 + bt + c}, \qquad y = B\sqrt{at^2 + bt + c},$$

where A and B are the roots of the system of algebraic (transcendental) equations

$$\left(ac - \tfrac{1}{4}b^2\right)A^4 = F(A, B),$$
$$\left(ac - \tfrac{1}{4}b^2\right)B^4 = G(A, B).$$

