**9.** $x''_{tt} = a_1 x + b_1 y + c_1, \quad y''_{tt} = a_2 x + b_2 y + c_2.$

The general solution of this system is given by the sum of its particular solution and the general solution of the homogeneous system (see equation 1.6).

$1^\circ$. Let $a_1 b_2 - a_2 b_1 \neq 0$. A particular solution:

$$x = x_0, \qquad y = y_0,$$

where the constants $x_0$ and $y_0$ are determined by solving the linear algebraic system

$$a_1 x_0 + b_1 y_0 + c_1 = 0, \qquad a_2 x_0 + b_2 y_0 + c_2 = 0.$$

$2^\circ$. Let $a_1 b_2 - a_2 b_1 = 0$ and $a_1^2 + b_1^2 > 0$. In this case, the system in question becomes

$$x''_{tt} = ax + by + c_1, \qquad y''_{tt} = k(ax + by) + c_2.$$

2.1. If $\sigma = a + bk \neq 0$, the original system has a particular solution

$$x = \tfrac{1}{2} b\sigma^{-1}(c_1 k - c_2)t^2 - \sigma^{-2}(ac_1 + bc_2), \qquad y = kx + \tfrac{1}{2}(c_2 - c_1 k)t^2.$$

2.2. If $\sigma = a + bk = 0$, the original system has a particular solution

$$x = \tfrac{1}{24} b(c_2 - c_1 k)t^4 + \tfrac{1}{2} c_1 t^2, \qquad y = kx + \tfrac{1}{2}(c_2 - c_1 k)t^2.$$

## Reference

**Kamke, E.,** *Differentialgleichungen: Lösungsmethoden und Lösungen, I, Gewöhnliche Differentialgleichungen*, B. G. Teubner, Leipzig, 1977.

 