1. Solve

$$\begin{aligned} x + y + z + t &= 4 \\ 2x + z &= 5 \\ -z + 3t &= 8 \\ x - y - z + 2t &= 7. \end{aligned}$$

2. Consider an equation

$$x^3 + y^3 - 3xy - 3 = 0.$$

   (a) Does there exist a function $y(x)$ given by the equation on some neighborhood of a point $(1, 2)$? Carefully verify all needed assumptions.

   (b) Compute $y'(1)$ for the function from the previous step.

   (c) Write an equation of the tangent line to the graph of the function y at the point $(1, 2)$.

3. Consider an equation

$$x'' + 4x' + 3x = 0.$$

   (a) Rewrite this second order equation as a first-order linear system (hint, use $x' = y$).

   (b) Solve the linear system.

   (c) Find a solution fulfilling the initial condition $x'(0) = 1$, $x(0) = 1$.

4. Consider a vector field

$$F(x, y) = (2x^3y^4 + x, 2x^4y^3 + y)$$

   (a) Write a definition of a potential of a vector field.

   (b) Verify whether the given field F has potential or not.

   (c) If F has potential, find it.