**FIRST ORDER LINEAR ODEs**

**Def:** A first order linear ODE is an equation that can be written as . . .

**Ex 1:** Are the following first order ODEs linear?

(a) \( \frac{dy}{dx} + y^3 = 0 \)

(b) \( \frac{dy}{dx} + y = x^3 \)

**Motivating Example:** Suppose \( a_0(x) = a_1'(x) \).

Idea for solving any first order linear ODE:
OK! Let’s find it:

Solving First Order Linear ODEs:

1.

2.

3.

4.

5.
Ex 1: Solve the ODE $x \frac{dy}{dx} + 2y = x^{-3}$
Ex 2: Solve the IVP \( \frac{dy}{dx} + \frac{3y}{x} + 2 = 3x, \quad y(1) = 1 \)

*Hint:* Since we start at time \( x = 1 \), assume \( x > 0 \).