Suggested problems 3

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1. Solve the initial value problem

$$\frac{dy}{dt} = 2y - 10, \qquad y(0) = y_0.$$

2. Solve the differential equation

$$x\sqrt{1 + y^2}dx + y\sqrt{1 + x^2}dy = 0.$$

3. Solve the initial value problem

$$\frac{dy}{dx} = \frac{3x^2 + 4x + 2}{2(y - 1)}, \qquad y(0) = -1,$$

and determine the interval in which the solution exists.