

Substitution Methods – Section 1.6

Math 81, Applied Analysis
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1 Homogeneous Equations

Definition: A **homogeneous first order differential equation** is a first order differential equation that can be written as

To solve, make the substitution

Substituting into (1) gives:

a separable equation.

Example: Solve the initial value problem

$$xyy' = 2y^2 + 4x^2, \quad y(2) = 4.$$

2 Other Substitutions

Example: Find a general solution of

$$y' = (x + y + 3)^2.$$

3 Bernoulli Equations

Definition: A **Bernoulli equation** is a first order differential equation of the form

To solve, reduce to linear form using a change of variables:

Example: Find a general solution of

$$xy' + y = 3x^3y^3.$$