

1.4. SEPARABLE EQUATIONS

Section Objective(s):

- Separable Differential Equations
- Euler Homogeneous Equations
- Solving Euler Homogeneous Equations

Remarks:

- Separable differential equations are _____.
- _____ just works.
- Euler homogeneous equations _____.
- Euler homogeneous equations _____
separable equations.
- One then _____ and then
_____.

1.4.1. Separable Differential Equations.

Definition 1. A *separable* differential equation for the function y is

where _____ are given functions.

Remark:

EXAMPLE 1.4.1: Find all solutions y to the differential equation

$$-\frac{y'}{y^2} = \cos(2t).$$

SOLUTION:

Theorem 1. (Separable Equations) If h, g are continuous, with $h \neq 0$, then

has infinitely many solutions y satisfying the algebraic equation

where _____ are antiderivatives of _____.

1.4.2. Euler Homogeneous Equations.

Definition 2. An *Euler homogeneous* differential equation has the form

_____.

EXAMPLE 1.4.2:

EXAMPLE 1.4.3: Show that _____ is Euler Homogeneous.

SOLUTION:

Theorem 2. If there is an integer _____ such that

then _____ is Euler homogeneous.

1.4.3. Solving Euler Homogeneous Equations.

Theorem 3. The Euler homogeneous equation

for the function y determines a separable equation for _____, given by

Proof:

□

EXAMPLE 1.4.4: Find all solutions y of the differential equation $y' = \frac{t^2 + 3y^2}{2ty}$.

SOLUTION: