First Order Linear Differential Equations

This is a linear differential equation where the highest power of the derivative is 1 (first order).y(x) is

The DIFFERENTIAL FORM

if

The general standard form for a first order ODE in the function

Sample questions.

Write the differential equation

METHODS OF SOLVING

1. Direct Integration

2. Integrating Factor Method

3. Means of Separating Variables

4. Picard’s Iterative Method

INTEGRATING FACTOR METHOD

1. Write the equation in the standard form

2. Identify the functions p(x) and q(x)

3. Determine the integrated factor

4. Write the general solution

Solve the following questions

1. Answer:

2. Answer:

3.

4. Answer:

METHOD OF SEPARATING VARIABLES

1. Separate variables. On one side, we want only y-variables and dy. On the other side, we want only x-variables and dx’s.

2. Integrate both sides

3. Add the constant of integration to the x-side of the integrals

4. Solve and make y the subject of the formula

The formula you get is called the general solution. If you are given an initial value, y(1)=2, then you find the specific solution

Solve the following

1. . Givne the initial position y(1) =2, find the specific solution

Answers: and

2. At point Answer:

3. At

4.

HOMOGENEOUS EQUATIONS

A homogeneous differential equation is a type of differential equation that can be written in the form , where f is a function of the ration . This means that both sides of the equation are homogeneous functions of the same degree of x and y.

Example 1:

This is a homogeneous differential equation, since both sides are homogeneous functions of degree one. We can solve it by substituting y=vx and separating the variables.

{{x{dv over dx}}} = {{2+v} over {1-2v}}

Example 2: