**Bernoulli Equations :** We now consider a rather special type of equation that can be reduced to a linear equation by an appropriate transformation . This is the so -called Bernoulli equation .

An equation of the form



Is called a Bernoulli equation .

Bernoulli’s equation convert in the first order linear ordinary differential equation

**Proof** : We first divide equation (1) by





Let 

Derivative 





Putting (3) and (4) in equation (2)







Let 



which is the first order Linear ODE

*PROBLEM - 1:*



This is a Bernoulli equation.

Drivingon both side we get,

Or, 

Let,

Or,

Or,

Putting (3) and (4) in equation (2):











Multiplying in equation (5):





Integrating both sides:



Let 

Then, 

Now,







*Problem 25:* 

***Solution:***



Multiplying  on both sides, we get:



Let 





Putting (3) and (4) in equation (2)















We multiplying the x2 to the equation (5)





Integrating ,







We apply the I.C 

Let  ,  in (6) to obtain ,





Thus the particular solution of the stated I.V.P is 

*Problem 8:*  

***Solution:***





Let 









Integrating (6) we have,

We start by decomposing the integrand into partial fraction:



To find A and B, we first write;



To determine the coefficients of A and B, we solve the equation,









Adding a and b equation,







Therefore, the partial fraction are:



Now we integrate,





Now we see that ,









We multiplying (7)the equation (5)





Integrating,

**

**

*Problem 9:* 

***Solution:***









y=v ……………………..(3)



We get, (This is a first order linear ODE.)

Solving this,











Multiplying the x of this equation (5)





Integrating,



Where c is the arbitrary constant which is the required general solution.

Thus, the general solution is:



*Problem 10*

***Solution:***

**

**

**

**

Let, x=v





This is a first order linear ODE.

Solving this,











Multiplying in the equation (5)





In Integration we find,



Let, set



Then we have,





Where c is the arbitrary constant which is the required general solution.



Equation solve from [Differential Equations: Shepley L. Ross,](https://www.rokomari.com/book/109911/differential-equations)

Problem 1:

Solution:



Let,



Putting (2) and (3) in equation (1):



I.F 









Multiplying in equation (4):







Intrigrating both sides:







 which is the first line ODE.

Problem-2: 

Solution:





Let,



Putting (3) and (4) in equation (2):



I.F 









Multiplying  in equation(5):







Intrigating both side,







 which is the first line ODE.

Problem-3:

Solution:



Let,



Putting(3) and (2) in equation (1):



I.F 





Multiplying  in equation (4):





Intrigating both side,







 which is the first line ODE.

**Problem-4:**

Solution:



**Let** 



**Putting (2) and (3) in equation (1):**



I.F 





**Multiplying**  **in equation (4):**





**Integrating both sides:**





Then,

**Now,**











 which is the first line ODE.

Problem-5:

Solution:



Let 



Putting (2) and (3) in equation (1):



I.F 







Multiplying ​ in equation (4):





**Integrating both sides:**





Which is the solution to the first line ODE

**Problem – 6:**

Solution:





Let 



Putting (3) and (4) in equation (2):



**I.F**







Multiplying  in equation (5)







Integrating both sides:







 which is the solution of the first line ODE.

Problem-7:

Solution:





Let 

Then, 

Putting (3) and (4) in equation (2):



I.F





Integrating (6), we have,

We start by decomposing the integrand into partial fractions:



To find  and , we first write:



**To determine the coefficients of A and B, we solve the equation:**









Adding equations (a) and (b):







Therefore, the partial fraction is:



Now we integrate,









Now we see that,





Multiplying (7) in equation (6):





Integrating both sides:











Which is the first line ODE.