**Old Solution:**

Due to Newton’s Cooling Law:

Where:

: Temperature of a body at time .

: Positive constant characteristic of the system.

: Environment temperature.

Converting temperature:

With the condition given in the prolem:

From , Solve for , we obtain:

If , Solve for , we get (minutes)

Therefore, it took 3.06 minutes to reads 15

**New Solution:**

Due to Newton’s Cooling Law:

Where:

: Temperature of a body at time .

: Positive constant characteristic of the system.

: Environment temperature.

With the condition given in the prolem:

From , Solve for , we obtain:

If , Solve for , we get (minutes)

Therefore, it took 3.06 minutes to reads 15

Given that:

Where:

Therefore the given differential equation is exact.

Solve the given differential equation:

Integrating both sides we obtain the final result:

Given that:

With the initial condition: , it leads to:

Hence, the solution of the equation is:

Or:

a) Given that:

Where:

Characteristic equation of the given ODE:

Since the right hand side of the given equation has two terms and , therefore the particular solution also has two term: , respectively.

Solve fore from:

Since, is not a root of characteristic equation.

Hence:

Solve fore from:

Since, is double root of characteristic equation.

Hence:

So:

b) Given that:

Where:

Characteristic equation of the given ODE:

So, the complement solution is:

Since the right hand side of the given equation has two terms and , therefore the particular solution also has two term: , respectively.

Solve fore from:

Since, is not a root of characteristic equation.

So, has the following form:

Substituting into the equation we obtain:

Therefore:

Solve fore from:

Since, is not a root of characteristic equation.

So, has the following form:

Substituting into the equation we obtain:

Therefore:

So:

Thus, the general solution of the given differential equation is:

a) Given that:

We have: .

We know that is a solution of , therefore substituting into , we get:

Thus, with , is a solution of

b) To find the general solution of , we rewire in the following form:

The Wronskian determinant for the equation is:

Hence:

Choose

Since, the Wronskian determinant different from 0 for some , therefore and are linearly independence solution of the equation.

Thus, the general solution of the equation is: