Given that:

Characteristic equation of the given DE:

So, the complement solution is:

Multiply both sides of by , we get:

Integrating both sides, it leads to:

Integrating both sides, it leads to:

Comparing (1) and (2), we obtain the particular solution:

Given that:

Proof that is a solution of :

We have: .

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

Thus, is a solution of

Given that:

Find the general solution of

To find the another 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 all , therefore and are linearly independence solution of the homogeneous equation or equation .

Thus, the complement solution of the equation is:

Assume that has the following form: , must be satisfied equation . It holds that:

Hence,

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

a) Given that:

Where:

Characteristic equation of the given ODE:

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

Solve fore from:

Since, is not a root of characteristic equation.

Hence, has the following form:

Solve fore from:

Since, is double root of characteristic equation.

Hence, has the following form:

Solve fore from:

Since, is a single root of characteristic equation.

Hence, has the following form:

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 terms: , respectively.

Solve fore from:

Since, is a single 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:

Differentiating both sides of , we get: .

Taking , we obtain:

Substituting into , it leads to:

Characteristic equation:

Therefore:

From :

Thus, the solution of the given system of differential equations is:

Let be the number of grams of C present at time (minute). Due to the fact that 1 gram of A and 4 grams of B used to combine C, therefore, the amount of A and B used are , respectively.

The amount of remain chemical A:

The amount of remain chemical B:

The problem tells us that the rate of formed chemical C depends on the proportional product of instantaneous amount of A and B not converted to C. It means that:

Integrating both sides we get:

With the initial condition:

From (1) solve for , we get:

Therefore: grams

And: