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|  | Lecture Notes | 06th June 2023 |

* Non-homogeneous ODE with constant coefficients.
* Method of undetermined coefficients.

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**Theory**:

Non-homogeneous ODE with constant coefficients:

One way to solve this type of ODE is method of undetermined coefficient.

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1. We solve the homogeneous ODE ( ); we call the solution .
2. We then find a particular solution of the non-homogeneous case .
3. The solution of non-homogeneous ODE is

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To find , we focus on . We have six cases:

1. is a polynomial.

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1. is trigonometric.

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1. is exponential.

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1. is multiplication of polynomial and exponential.

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1. is multiplication of trigonometric and exponential.

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1. is multiplication of trigonometric polynomial.

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**Solve the following**:

Example 1:

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Example 2:

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This method fails for some problems.

If there is any duplication between homogeneous solution and your choice of then this method fails.

To fix this issue instead of we should consider . Now if and have any duplication then we should consider . So , , … continued till there’s no duplication.

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**Solve the following**:

Example 1:

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Now we can see that there is a duplication between homogeneous solution and your choice of

Example 2:

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Now we can see that there is a duplication between homogeneous solution and your choice of

We can still see that there is a duplication between homogeneous solution and your choice of