Week 04 Participation Assignment (2 of 2)

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Contents

1 Part 2

When we try to use the method of Undetermined Coefficients, the most important step is to write the correct form of the particular solution based on the given f(x) and the roots of the homogeneous equation.

For this exercise, we would like to practice on how to write the form of a particular solution for the given differential equations (Do not solve for it, just write the form of a particular solution):

1.1 a)

$$\begin{aligned} y'' + y &= \sin(x) + x\cos(x) + e^{3x} \\ r^2 + r &= 0 \\ r &= 0, -1 \\ y_p(x) &= A\sin(x) + B\cos(x) + Cx^2\sin(x) - Dx\cos(x) + Ee^{3x} \end{aligned}$$

$$\boxed{y_p(x) = A\sin(x) + B\cos(x) + Cx^2\sin(x) - Dx\cos(x) + Ee^{3x}}$$

1.2 b)

$$\begin{aligned} y'' - y &= e^x + x^2e^{2x} \\ r^2 - r &= 0 \\ r &= 1, 0 \\ y_p(x) &= Ae^x + Bx^2e^{2x} + Cxe^{2x} + De^{2x} \end{aligned}$$

$$\boxed{y_p(x) = Ae^x + Bx^2e^{2x} + Cxe^{2x} + De^{2x}}$$

1.3 c)

$$
\begin{aligned}
y'' - y - 2y &= e^x \sin(x) - x^2 \\
r^2 - r - 2 &= 0 \\
r &= 2, -1 \\
y_p(x) &= Ae^x \sin(x) - Be^x \cos(x) + Cx^2 + Dx
\end{aligned}
$$

$$\boxed{y_p(x) = Ae^x \sin(x) - Be^x \cos(x) + Cx^2 + Dx}$$

1.4 d)

$$
\begin{aligned}
y'' + 5y' + 6y &= \sin(x) + \cos(2x) \\
r^2 + 5r + 6 &= 0 \\
r &= -2, -3 \\
y_p(x) &= A\cos(x) + B\sin(x) + C\cos(2x) + D\sin(2x)
\end{aligned}
$$

$$\boxed{y_p(x) = A\cos(x) + B\sin(x) + C\cos(2x) + D\sin(2x)}$$

1.5 e)

$$
\begin{aligned}
y'' - 4y' + 5y &= e^{2x} + 3\cos(x) + e^{2x}\sin(x) \\
r^2 - 4r + 5 &= 0 \\
r &= 2 \pm i \\
y_p(x) &= Ae^{2x} + B\cos(x) + C\sin(x) + De^{2x}\sin(x) + E^{2x}\cos(x)
\end{aligned}
$$

$$\boxed{y_p(x) = Ae^{2x} + B\cos(x) + C\sin(x) + De^{2x}\sin(x) + E^{2x}\cos(x)}$$

1.6 f)

$$
\begin{aligned}
y'' - 4y' + 4y &= x^2e^{2x} - e^{2x} \\
r^2 - 4r + 4 &= 0 \\
r &= 2 \\
y_p(x) &= Ax^2e^{2x} + Bxe^{2x} + Ce^{2x} + De^{2x}
\end{aligned}
$$

$$\boxed{y_p(x) = Ax^2e^{2x} + Bxe^{2x} + Ce^{2x} + De^{2x}}$$