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Rules to find Particular Integral (P.I.)

i) $\frac{1}{f(D)} \cdot e^{ax} = \frac{1}{f(a)} \cdot e^{ax}$

If $f(a)=0$, then $\frac{1}{f(D)} \cdot e^{ax} = \frac{x}{f'(a)} \cdot e^{ax}$.

If $f'(a)=0$, then $\frac{1}{f(D)} \cdot e^{ax} = \frac{x^2}{f''(a)} \cdot e^{ax}$

ii) $\frac{1}{f(D)} \cdot x^n = [f(D)]^{-1} \cdot x^n$

Expand $[f(D)]^{-1}$ & then operate.

iii) $\frac{1}{f(D^2)} \sin ax = \frac{1}{f(-a^2)} \sin ax$

$\frac{1}{f(D^2)} \cos ax = \frac{1}{f(-a^2)} \cdot \cos ax$

If $f(-a^2)=0$, $\frac{1}{f(D^2)} \sin ax = \frac{x}{f'(-a^2)} \cdot \sin ax$

If $f(-a^2)=0$, $\frac{1}{f(D)} \cdot \cos ax = \frac{x}{f'(-a^2)} \cdot \cos ax$

iv) $\frac{1}{f(D)} \cdot e^{ax} \cdot \phi(x) = e^{ax} \cdot \frac{1}{f(D+a)} \cdot \phi(x)$

v) $\frac{1}{D+a} \cdot \phi(x) = e^{-ax} \int e^{ax} \cdot \phi(x) \cdot dx$

To find particular integral of (METHOD OF VARIATION)

$$\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = X$$

Here, $C.F. = Ay_1 + By_2$
where A & B are constants.

$$P.I. = y = uy_1 + vy_2$$
where u and v are funⁿ. of x

Here, $W = \begin{vmatrix} y_1 & y_2 \\ y_1' & y_2' \end{vmatrix}$

Find u & v :

$$u = \int \frac{-y_2 X}{W} dx \quad \&$$

$$v = \int \frac{y_1 X}{W} dx$$