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(*Solve y''+xy'+y=3x^2+2,
using variation of parameter technique in mathematica*)
Inhom = y''[x] + x * y'[x] + y[x] == 3 x^2 + 2;
Homeq = y''[x] + x * y'[x] + y[x] == 0;
Hsol = DSolve[Homeq, y[x], x]

Hsol = y[x] /. Hsol[[1]]

y1 = Hsol /. {C[1] → 1, C[2] → 0}
y2 = Hsol /. {C[1] → 0, C[2] → 1}

Wronskian = Det[{{y1, y2}, {D[y1, x], D[y2, x]}}]

yp = -y1 * Integrate[y2 * (3 * x^2 + 2) / Wronskian, x] +
  y2 * Integrate[y1 * (3 * x^2 + 2) / Wronskian, x]

gensol1 = (Hsol + yp) // Simplify

nHsol = DSolve[Inhom, y[x], x]

gensol2 = y[x] /. nHsol[[1]] // Simplify

If[gensol1 == gensol2, Print["sol are equal"], Print["sol are not equal"]]
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