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> restart
> Ecuacion := y'' + 2/x y' + y = 1/x

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$$Ecuacion := \frac{d^2}{dx^2} y(x) + \frac{2 \left( \frac{d}{dx} y(x) \right)}{x} + y(x) = \frac{1}{x} \quad (1)$$

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> EcuacionHomogenea := lhs(Ecuacion) = 0; Q(x) := rhs(Ecuacion)

```

$$EcuacionHomogenea := \frac{d^2}{dx^2} y(x) + \frac{2 \left( \frac{d}{dx} y(x) \right)}{x} + y(x) = 0$$

$$Q(x) := \frac{1}{x} \quad (2)$$

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> SolucionHomogenea := y(x) = C1*sin(x)/x + C2*cos(x)/x

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$$SolucionHomogenea := y(x) = \frac{C1 \sin(x)}{x} + \frac{C2 \cos(x)}{x} \quad (3)$$

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> comprobacion1 := simplify(eval(subs(y(x) = rhs(SolucionHomogenea),
    EcuacionHomogenea)))

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$$comprobacion1 := 0 = 0 \quad (4)$$

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> Solucion1 := sin(x)/x; Solucion2 := cos(x)/x;

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$$Solucion_1 := \frac{\sin(x)}{x}$$

$$Solucion_2 := \frac{\cos(x)}{x} \quad (5)$$

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> SolucionNoHomogenea := y(x) = A(x)*Solucion1 + B(x)*Solucion2;

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$$SolucionNoHomogenea := y(x) = \frac{A(x) \sin(x)}{x} + \frac{B(x) \cos(x)}{x} \quad (6)$$

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> with(linalg):
> AA := wronskian([Solucion1, Solucion2], x);

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$$AA := \begin{bmatrix} \frac{\sin(x)}{x} & \frac{\cos(x)}{x} \\ \frac{\cos(x)}{x} - \frac{\sin(x)}{x^2} & -\frac{\sin(x)}{x} - \frac{\cos(x)}{x^2} \end{bmatrix} \quad (7)$$

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> BB := array([0, Q(x)]);

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$$BB := \begin{bmatrix} 0 & \frac{1}{x} \end{bmatrix} \quad (8)$$

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> SOL := linsolve(AA, BB);

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$$SOL := \begin{bmatrix} \frac{\cos(x)}{\cos(x)^2 + \sin(x)^2} & -\frac{\sin(x)}{\cos(x)^2 + \sin(x)^2} \end{bmatrix} \quad (9)$$

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> Aprima := simplify(SOL1); Bprima := simplify(SOL2);

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$$\begin{aligned}
 & \text{Aprima} := \cos(x) \\
 & \text{Bprima} := -\sin(x) \tag{10} \\
 & A(x) := \int(Aprima, x) + C1; B(x) := \int(Bprima, x) + C2; \\
 & A(x) := \sin(x) + C1 \\
 & B(x) := \cos(x) + C2 \tag{11} \\
 & \text{SolucionFinal} := \text{simplify}(\text{SolucionNoHomogenea}); \\
 & \text{SolucionFinal} := y(x) = \frac{1 + C1 \sin(x) + C2 \cos(x)}{x} \tag{12} \\
 & \text{Comprobacion2} := \text{dsolve}(Ecuacion) \\
 & \text{Comprobacion2} := y(x) = \frac{\sin(x) - C2}{x} + \frac{\cos(x) - C1}{x} + \frac{1}{x} \tag{13}
 \end{aligned}$$