```
> restart
```

SOLUCIONES GENERALES, PARTICULARES Y FUNDAMENTALES

```
> SolucionGeneral := y(x) = C1·exp(x) + C2·exp(2·x) + C3·exp(3·x) + C4·exp(-2·x);
```

$$SolucionGeneral := y(x) = C1\,e^{x} + C2\,e^{2x} + C3\,e^{3x} + C4\,e^{-2x} \tag{1}$$

```
> SolFund[1] := exp(x); SolFund[2] := exp(2·x); SolFund[3] := exp(3·x); SolFund[4]
    := exp(-2·x);
```

$$SolFund_1 := e^{x}$$

$$SolFund_2 := e^{2x}$$

$$SolFund_3 := e^{3x}$$

$$SolFund_4 := e^{-2x} \tag{2}$$

```
> WW := array([[SolFund[1], SolFund[2], SolFund[3], SolFund[4]], [diff(SolFund[1], x),
    diff(SolFund[2], x), diff(SolFund[3], x), diff(SolFund[4], x)], [diff(SolFund[1], x$2),
    diff(SolFund[2], x$2), diff(SolFund[3], x$2), diff(SolFund[4], x$2)], [diff(SolFund[1], x$3),
    diff(SolFund[2], x$3), diff(SolFund[3], x$3), diff(SolFund[4], x$3)]]);
```

$$WW := \begin{bmatrix} e^{x} & e^{2x} & e^{3x} & e^{-2x} \\ e^{x} & 2\,e^{2x} & 3\,e^{3x} & -2\,e^{-2x} \\ e^{x} & 4\,e^{2x} & 9\,e^{3x} & 4\,e^{-2x} \\ e^{x} & 8\,e^{2x} & 27\,e^{3x} & -8\,e^{-2x} \end{bmatrix} \tag{3}$$

```
> with(linalg):
> WWW := wronskian([SolFund[1], SolFund[2], SolFund[3], SolFund[4]], x);
```

$$WWW := \begin{bmatrix} e^{x} & e^{2x} & e^{3x} & e^{-2x} \\ e^{x} & 2\,e^{2x} & 3\,e^{3x} & -2\,e^{-2x} \\ e^{x} & 4\,e^{2x} & 9\,e^{3x} & 4\,e^{-2x} \\ e^{x} & 8\,e^{2x} & 27\,e^{3x} & -8\,e^{-2x} \end{bmatrix} \tag{4}$$

```
> comprobacion := det(WWW) ≠ 0;
```

$$comprobacion := -120\,e^{x}\,e^{2x}\,e^{3x}\,e^{-2x} \neq 0 \tag{5}$$

```
> SolucionGeneral;
```

$$y(x) = C1\,e^{x} + C2\,e^{2x} + C3\,e^{3x} + C4\,e^{-2x} \tag{6}$$

```
> Sistema := diff(SolucionGeneral, x), diff(SolucionGeneral, x$2), diff(SolucionGeneral, x
    $3), diff(SolucionGeneral, x$4) : Sistema[1]; Sistema[2]; Sistema[3]; Sistema[4];
```

$$\frac{d}{dx}y(x) = C1\,e^{x} + 2\,C2\,e^{2x} + 3\,C3\,e^{3x} - 2\,C4\,e^{-2x}$$

$$\frac{d^2}{dx^2}y(x) = C1\,e^{x} + 4\,C2\,e^{2x} + 9\,C3\,e^{3x} + 4\,C4\,e^{-2x}$$

$$\frac{d^3}{dx^3}y(x) = C1\,e^{x} + 8\,C2\,e^{2x} + 27\,C3\,e^{3x} - 8\,C4\,e^{-2x}$$

$$\frac{d^4}{dx^4} y(x) = C1\, e^{x} + 16\, C2\, e^{2x} + 81\, C3\, e^{3x} + 16\, C4\, e^{-2x} \quad (7)$$

> $SOL := solve(\{Sistema\}, \{C1, C2, C3, C4\}) : SOL_1; SOL_2; SOL_3; SOL_4;$

$$C1 = \frac{1}{6} \frac{-4\left(\frac{d^2}{dx^2} y(x)\right) + 12\left(\frac{d}{dx} y(x)\right) - 3\left(\frac{d^3}{dx^3} y(x)\right) + \frac{d^4}{dx^4} y(x)}{e^{x}}$$

$$C2 = -\frac{1}{8} \frac{-5\left(\frac{d^2}{dx^2} y(x)\right) + 6\left(\frac{d}{dx} y(x)\right) - 2\left(\frac{d^3}{dx^3} y(x)\right) + \frac{d^4}{dx^4} y(x)}{e^{2x}}$$

$$C3 = \frac{1}{30} \frac{-4\left(\frac{d^2}{dx^2} y(x)\right) + 4\left(\frac{d}{dx} y(x)\right) - \left(\frac{d^3}{dx^3} y(x)\right) + \frac{d^4}{dx^4} y(x)}{e^{3x}}$$

$$C4 = -\frac{1}{120} \frac{-11\left(\frac{d^2}{dx^2} y(x)\right) + 6\left(\frac{d}{dx} y(x)\right) + 6\left(\frac{d^3}{dx^3} y(x)\right) - \left(\frac{d^4}{dx^4} y(x)\right)}{e^{-2x}} \quad (8)$$

> $SolucionGeneral;$

$$y(x) = C1\, e^{x} + C2\, e^{2x} + C3\, e^{3x} + C4\, e^{-2x} \quad (9)$$

> $EcuacionIntermedia := subs(C1 = rhs(SOL_1), C2 = rhs(SOL_2), C3 = rhs(SOL_3), C4 = rhs(SOL_4), lhs(SolucionGeneral) - rhs(SolucionGeneral) = 0);$

$$EcuacionIntermedia := y(x) + \frac{1}{12} \frac{d^2}{dx^2} y(x) - \frac{4}{3} \frac{d}{dx} y(x) + \frac{1}{3} \frac{d^3}{dx^3} y(x) - \frac{1}{12} \frac{d^4}{dx^4} y(x) = 0 \quad (10)$$

> $EcuacionDiferncialFinal := lhs(EcuacionIntermedia) \cdot (-12) = 0;$

$$EcuacionDiferncialFinal := -12\, y(x) - \left(\frac{d^2}{dx^2} y(x)\right) + 16\left(\frac{d}{dx} y(x)\right) - 4\left(\frac{d^3}{dx^3} y(x)\right) + \frac{d^4}{dx^4} y(x) = 0 \quad (11)$$

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