

$$\begin{aligned}
&> \text{restart} \\
&> SG := y(x) = C[1] \cdot \exp(3 \cdot x) + C[2] \cdot \exp(2 \cdot x) \\
&\quad SG := y(x) = C_1 e^{3x} + C_2 e^{2x}
\end{aligned} \tag{1}$$

$$\begin{aligned}
&> DSG := \text{diff}(SG, x) \\
&\quad DSG := \frac{d}{dx} y(x) = 3 C_1 e^{3x} + 2 C_2 e^{2x}
\end{aligned} \tag{2}$$

$$\begin{aligned}
&> DDSG := \text{diff}(DSG, x) \\
&\quad DDSG := \frac{d^2}{dx^2} y(x) = 9 C_1 e^{3x} + 4 C_2 e^{2x}
\end{aligned} \tag{3}$$

$$\begin{aligned}
&> Sist := DSG, DDSG : Sist[1]; Sist[2] \\
&\quad \frac{d}{dx} y(x) = 3 C_1 e^{3x} + 2 C_2 e^{2x} \\
&\quad \frac{d^2}{dx^2} y(x) = 9 C_1 e^{3x} + 4 C_2 e^{2x}
\end{aligned} \tag{4}$$

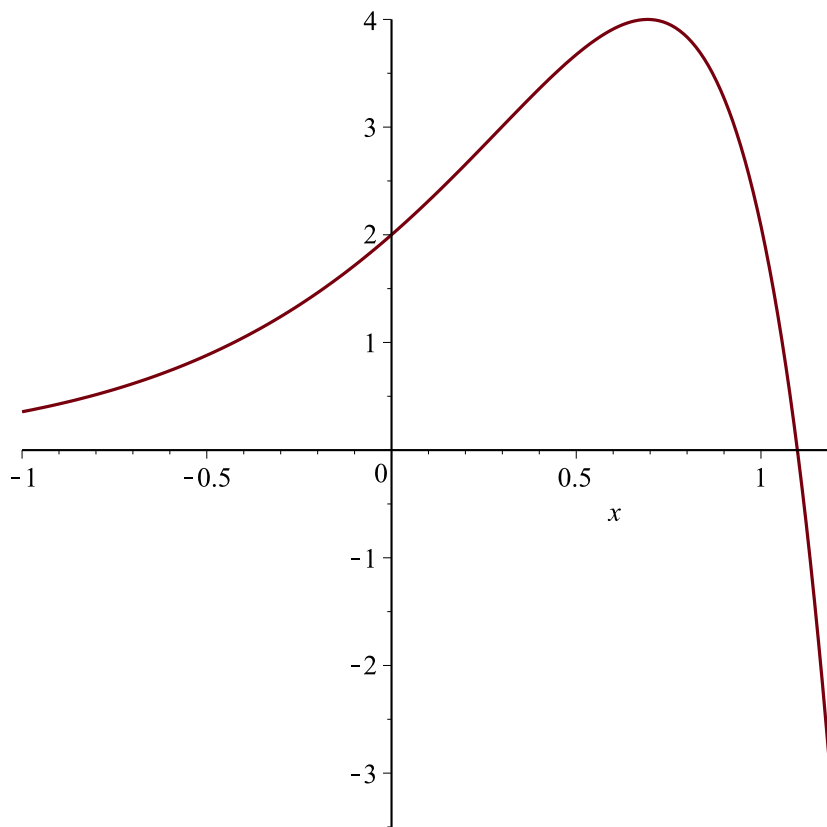
$$\begin{aligned}
&> \text{with(linalg)} : \\
&> Para := \text{solve}(\{Sist\}, \{C[1], C[2]\}) : Para[1]; Para[2] \\
&\quad C_1 = \frac{1}{3} \frac{\frac{d^2}{dx^2} y(x) - 2 \left(\frac{d}{dx} y(x) \right)}{e^{3x}} \\
&\quad C_2 = -\frac{1}{2} \frac{\frac{d^2}{dx^2} y(x) - 3 \left(\frac{d}{dx} y(x) \right)}{e^{2x}}
\end{aligned} \tag{5}$$

$$\begin{aligned}
&> EDO := \text{subs}(C[1] = \text{rhs}(Para[1]), C[2] = \text{rhs}(Para[2]), SG) \\
&\quad EDO := y(x) = -\frac{1}{6} \frac{d^2}{dx^2} y(x) + \frac{5}{6} \frac{d}{dx} y(x)
\end{aligned} \tag{6}$$

$$\begin{aligned}
&> EDOL := \text{lhs}(EDO) \cdot 6 - \text{rhs}(EDO) \cdot 6 = 0 \\
&\quad EDOL := 6 y(x) + \frac{d^2}{dx^2} y(x) - 5 \left(\frac{d}{dx} y(x) \right) = 0
\end{aligned} \tag{7}$$

$$\begin{aligned}
&> SP := \text{subs}(C[1] = -1, C[2] = 3, SG) \\
&\quad SP := y(x) = -e^{3x} + 3 e^{2x}
\end{aligned} \tag{8}$$

$$> \text{plot}(\text{rhs}(SP), x = -1 .. 1.2)$$



```
> restart
```

```
> Ecua := (x·2 + y(x)·2 + 1) - 2·x·y(x)·diff(y(x), x) = 0
```

$$Ecua := x^2 + y(x)^2 + 1 - 2xy(x) \left(\frac{d}{dx} y(x) \right) = 0 \quad (9)$$

```
> with(DEtools) :
```

```
> Tipo := odeadvisor(Ecua)
```

$$Tipo := [_rational, _Bernoulli] \quad (10)$$

```
> FactInt := intfactor(Ecua)
```

$$FactInt := \frac{1}{x^2} \quad (11)$$

```
> M := x^2 + y^2 + 1
```

$$M := x^2 + y^2 + 1 \quad (12)$$

```
> N := -2 x y
```

$$N := -2xy \quad (13)$$

```
> CompUno := simplify(diff(M, y) - diff(N, x)) = 0
```

$$CompUno := 4y = 0 \quad (14)$$

POR LO QUE LA EDO NO ES EXACTA

> $MM := \text{expand}(\text{FactInt} \cdot M); NN := \text{FactInt} \cdot N$

$$MM := 1 + \frac{y^2}{x^2} + \frac{1}{x^2}$$

$$NN := -\frac{2y}{x} \quad (15)$$

> $\text{CompDos} := \text{simplify}(\text{diff}(MM, y) - \text{diff}(NN, x)) = 0$

$$\text{CompDos} := 0 = 0 \quad (16)$$

> $\text{IntMMx} := \text{int}(MM, x)$

$$\text{IntMMx} := x - \frac{y^2}{x} - \frac{1}{x} \quad (17)$$

> $\text{SolGral} := \text{IntMMx} + \text{int}((NN - \text{diff}(\text{IntMMx}, y)), y) = C[1]$

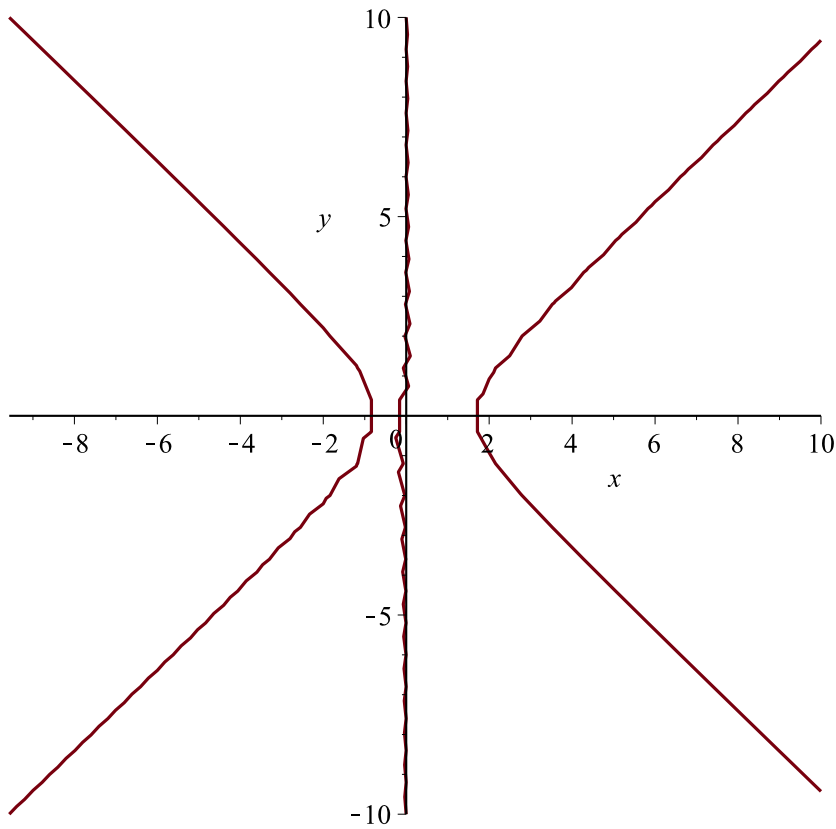
$$\text{SolGral} := x - \frac{y^2}{x} - \frac{1}{x} = C_1 \quad (18)$$

> $\text{SolPart} := \text{subs}(C[1] = 1, \text{SolGral})$

$$\text{SolPart} := x - \frac{y^2}{x} - \frac{1}{x} = 1 \quad (19)$$

> $\text{with}(\text{plots}) :$

> $\text{implicitplot}(\text{SolPart}, x = -10..10, y = -10..10)$



```
> restart
```

```
> Ecua := y(x)·3 + 2·(x·2 - x·y(x)·2)·diff(y(x), x) = 0
```

$$Ecua := y(x)^3 + 2(x^2 - x y(x)^2) \left(\frac{d}{dx} y(x) \right) = 0 \quad (20)$$

```
> CondIni := y(Pi) = 8
```

$$CondIni := y(\pi) = 8 \quad (21)$$

```
> with(DEtools) :
```

```
> odeadvisor(Ecua)
```

```
[[_homogeneous, class G], _rational] \quad (22)
```

```
> EcuaDos := eval(subs(y(x) = u(x)·x, Ecua))
```

$$EcuaDos := u(x)^3 x^3 + 2(x^2 - x^3 u(x)^2) \left(\left(\frac{d}{dx} u(x) \right) x + u(x) \right) = 0 \quad (23)$$

```
> EcuaDosPrima := simplify(isolate(EcuaDos, diff(u(x), x)))
```

$$EcuaDosPrima := \frac{d}{dx} u(x) = -\frac{1}{2} \frac{u(x) (u(x)^2 x - 2)}{x (u(x)^2 x - 1)} \quad (24)$$

$$\begin{aligned}
 &> \text{SolGral} := \text{int}\left(\frac{1}{\left(\frac{1}{2} \frac{u \cdot (u^2 x - 2)}{(u^2 x - 1)}\right)}, u\right) + \text{int}\left(\frac{1}{x}, x\right) = C[1] \\
 &\quad \text{SolGral} := \frac{1}{2} \ln(u^2 x - 2) + \ln(u) + \ln(x) = C_1
 \end{aligned} \tag{25}$$

$$\begin{aligned}
 &> \text{SolGralFinal} := \text{subs}\left(u = \frac{y}{x}, \text{SolGral}\right) \\
 &\quad \text{SolGralFinal} := \frac{1}{2} \ln\left(\frac{y^2}{x} - 2\right) + \ln\left(\frac{y}{x}\right) + \ln(x) = C_1
 \end{aligned} \tag{26}$$

$$\begin{aligned}
 &> \text{Para} := \text{subs}(x = \text{Pi}, y = 8, \text{lhs}(\text{SolGralFinal})); \text{evalf}(\%, 3) \\
 &\quad \text{Para} := \frac{1}{2} \ln\left(\frac{64}{\pi} - 2\right) + \ln\left(\frac{8}{\pi}\right) + \ln(\pi) \\
 &\quad \quad \quad 3.53
 \end{aligned} \tag{27}$$

$$\begin{aligned}
 &> \text{SolPart} := \text{subs}(C[1] = \text{Para}, \text{SolGralFinal}) \\
 &\quad \text{SolPart} := \frac{1}{2} \ln\left(\frac{y^2}{x} - 2\right) + \ln\left(\frac{y}{x}\right) + \ln(x) = \frac{1}{2} \ln\left(\frac{64}{\pi} - 2\right) + \ln\left(\frac{8}{\pi}\right) + \ln(\pi)
 \end{aligned} \tag{28}$$

> with(plots) :

> implicitplot(SolPart, x = 3 .. 20, y = 0 .. 20, scaling = CONSTRAINED)

