Exemplo 2: (pg 30 Boyce & DiPrima 9ed.)

Resolva a equacão diferencial

$$\frac{dy}{dt} - 2\,y = 4 - t$$

e desenhe graficos de diversas soluçõees. Discuta o comportamento das soluções quando $t \rightarrow infinito$.

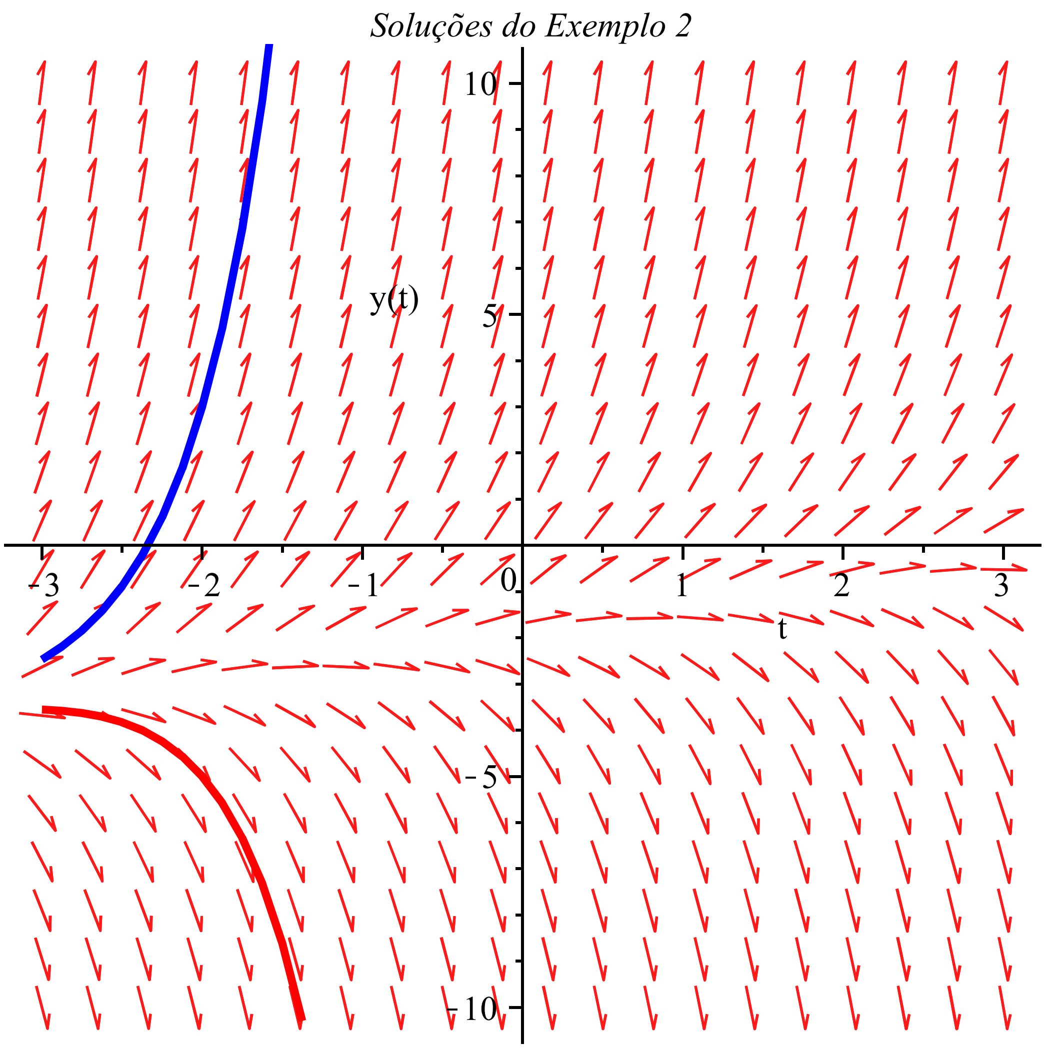
```
> restart :
> with(DEtools) : with(plots) :
> eq1 := diff(y(t), t) - 2·y(t) = 4 − t :
  dsolve(eq1);
```

$$y(t) = -\frac{7}{4} + \frac{1}{2}\,t + e^{2\,t}\,\_C1 \quad \textbf{(1)}$$

```
> mu := intfactor(eq1);
```

$$\mu := e^{-2\,t} \quad \textbf{(2)}$$

```
> P1 := DEplot(eq1, y(t), t=-3 ..3, [[y(-2) = 3], [y(-2) =-5]], linecolor = [blue, red], y=-10
      ..10) :
  FP := dfieldplot(eq1, y(t), t=-3 ..3, y=-10 ..10) :
  display( {FP}, {P1}, title = `Soluções do Exemplo 2`);
```



Exemplo 1 (sec 2.2, Boyce 9ed.pg 36)

Mostre que a equação

$$\frac{dy}{dx} = \frac{x^2}{1 - y^2}$$

é separavel e depois encontre uma equaçã para suas curvas integrais. Desenhe algumas soluções para diferentes valores iniciais.

```
> restart : with(DEtools) : with(plots) :
> eq2 := diff(y(x), x) = x^2/(1 - y(x)^2);
  sol1 := dsolve(eq2, y(x));
```

$$eq2 := \frac{d}{dx} y(x) = \frac{x^2}{1 - y(x)^2} \qquad (2)$$

$$sol1 := y(x) = \frac{1}{2}\left(-4\,x^3 - 12\,\_C1 + 4\sqrt{-4 + x^6 + 6\,x^3\,\_C1 + 9\,\_C1^2}\right)^{1/3} \quad \textbf{(3)}$$

$$+ \frac{2}{\left(-4\,x^3 - 12\,\_C1 + 4\sqrt{-4 + x^6 + 6\,x^3\,\_C1 + 9\,\_C1^2}\right)^{1/3}}, y(x) = -\frac{1}{4}\left(-4\,x^3\right.$$

$$\left. - 12\,\_C1 + 4\sqrt{-4 + x^6 + 6\,x^3\,\_C1 + 9\,\_C1^2}\right)^{1/3}$$

$$- \frac{1}{\left(-4\,x^3 - 12\,\_C1 + 4\sqrt{-4 + x^6 + 6\,x^3\,\_C1 + 9\,\_C1^2}\right)^{1/3}} - \frac{1}{2}\,\mathrm{I}\sqrt{3}\left(\frac{1}{2}\left(-4\,x^3\right.\right.$$

$$\left. - 12\,\_C1 + 4\sqrt{-4 + x^6 + 6\,x^3\,\_C1 + 9\,\_C1^2}\right)^{1/3}$$

$$\left. - \frac{2}{\left(-4\,x^3 - 12\,\_C1 + 4\sqrt{-4 + x^6 + 6\,x^3\,\_C1 + 9\,\_C1^2}\right)^{1/3}}\right), y(x) = -\frac{1}{4}\left(-4\,x^3\right.$$

$$\left. - 12\,\_C1 + 4\sqrt{-4 + x^6 + 6\,x^3\,\_C1 + 9\,\_C1^2}\right)^{1/3}$$

$$- \frac{1}{\left(-4\,x^3 - 12\,\_C1 + 4\sqrt{-4 + x^6 + 6\,x^3\,\_C1 + 9\,\_C1^2}\right)^{1/3}} + \frac{1}{2}\,\mathrm{I}\sqrt{3}\left(\frac{1}{2}\left(-4\,x^3\right.\right.$$

$$\left. - 12\,\_C1 + 4\sqrt{-4 + x^6 + 6\,x^3\,\_C1 + 9\,\_C1^2}\right)^{1/3}$$

$$\left. - \frac{2}{\left(-4\,x^3 - 12\,\_C1 + 4\sqrt{-4 + x^6 + 6\,x^3\,\_C1 + 9\,\_C1^2}\right)^{1/3}}\right)$$

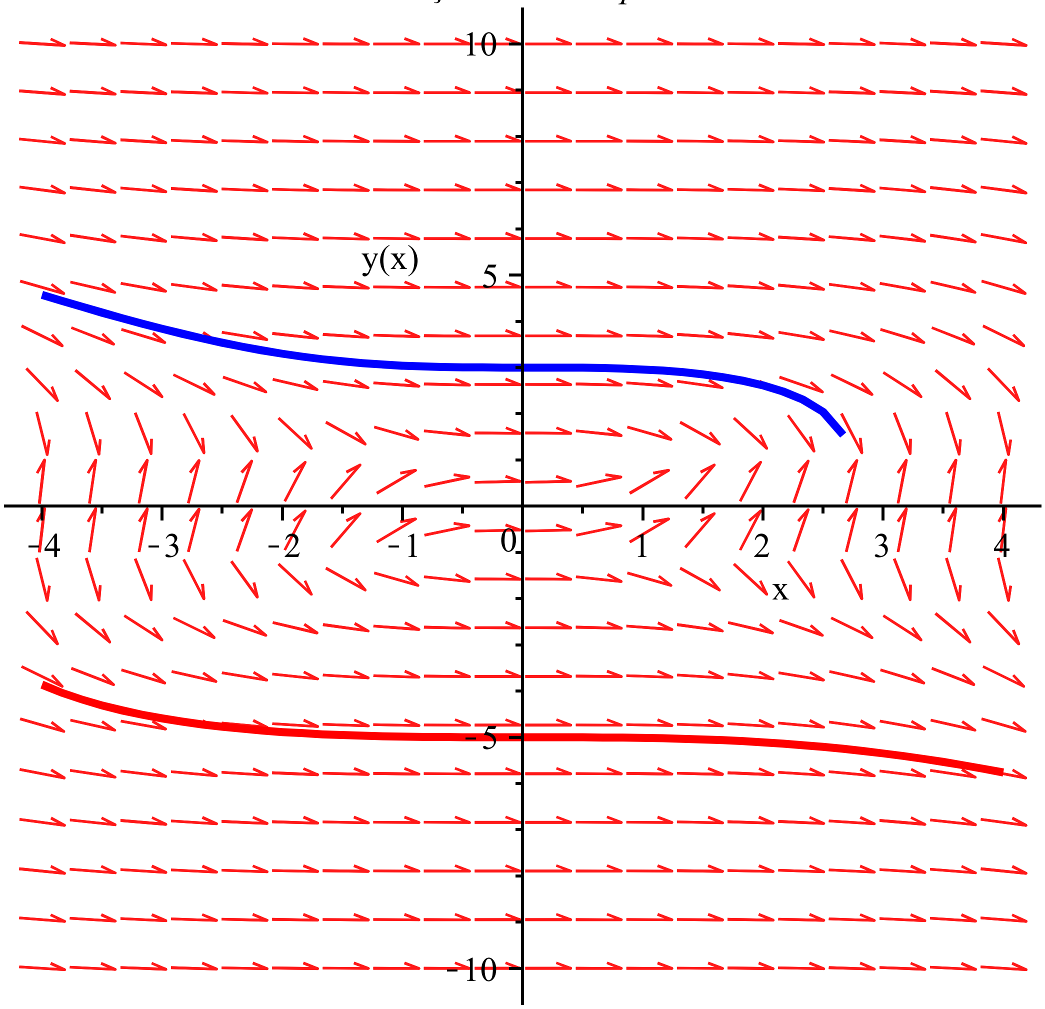
```
> sol2 := dsolve(eq2, y(x), implicit);
```

$$sol2 := \frac{1}{3}\,x^3 - y(x) + \frac{1}{3}\,y(x)^3 + \_C1 = 0 \quad \textbf{(4)}$$

```
> P1 := DEplot(eq2, y(x), x=-4..4, [[y(0)=3], [y(0)=-5], [y(3)=-1]], linecolor=[blue,
      red, blue], y=-10..10) :
  FP := dfieldplot(eq2, y(x), x=-4..4, y=-10..10) :
   display({FP}, {P1}, title=`Soluções do Exemplo 3`);
```

```
Warning, plot may be incomplete, the following errors(s) were
issued:
   cannot evaluate the solution further right of 2.7144180,
probably a singularity
Warning, plot may be incomplete, the following errors(s) were
issued:
   cannot evaluate the solution past the initial point, problem
may be complex, initially singular or improperly set up
```

Soluções do Exemplo 3



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Exercício 8 (pg 40 - Boyce 9ed.)
 Encontre a solução geral da equação diferencial:

$$\frac{dy}{dx} = \frac{x^2}{1+y^2}$$

Desenhe alguns membros de famílias de soluções.

\> *restart* : *with*(*DEtools*) : *with*(*plots*) :

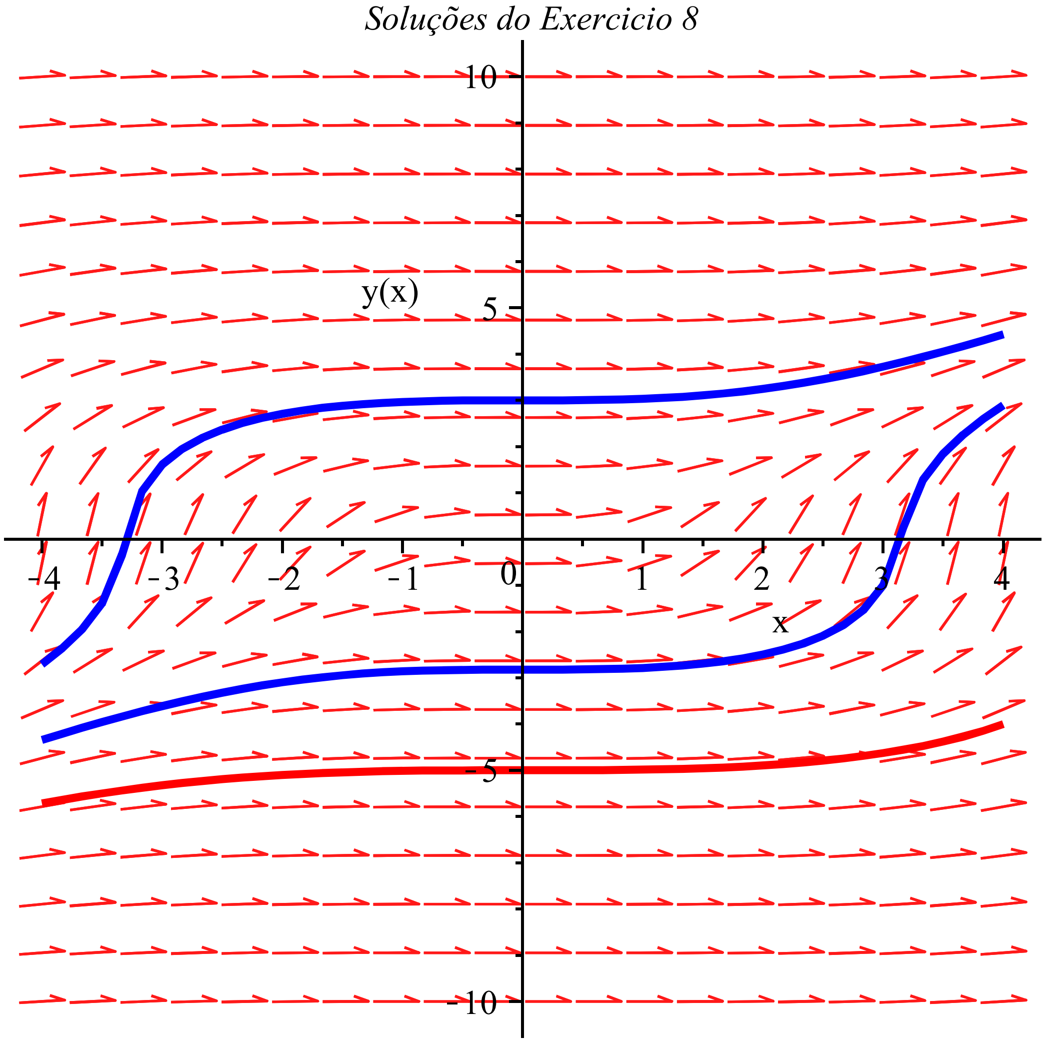
\> $eq3 := diff(y(x), x) = \frac{x^2}{1+y(x)^2};$
  $sol3 := dsolve(eq3, y(x), implicit);$

$$eq3 := \frac{d}{dx}\, y(x) = \frac{x^2}{1+y(x)^2}$$

$$sol3 := \frac{1}{3}\, x^3 - y(x) - \frac{1}{3}\, y(x)^3 + \_C1 = 0 \qquad \textbf{(5)}$$

\> $P1 := DEplot(eq3, y(x), x=-4..4, [[y(0)=3], [y(0)=-5], [y(3)=-1]], linecolor=[blue,$

```
red, blue], y=-10..10) :
FP := dfieldplot(eq3, y(x), x=-4..4, y=-10..10) :
display({FP}, {P1}, title=`Soluções do Exercicio 8`);
```



>