

Exercício 1

$$y' = 3 - 2y$$

```
(Debug) In[ ]:= solucaoDif = DSolve[y' [x] == 3 - 2 y[x], y[x], x];
```

```
(Debug) In[ ]:= solveC1 = Solve[y == solucaoDif[[1, 1, 2]], C[1]];
```

```
(Debug) In[ ]:= c1[x_, y_] := solveC1[[1, 1, 2]];
```

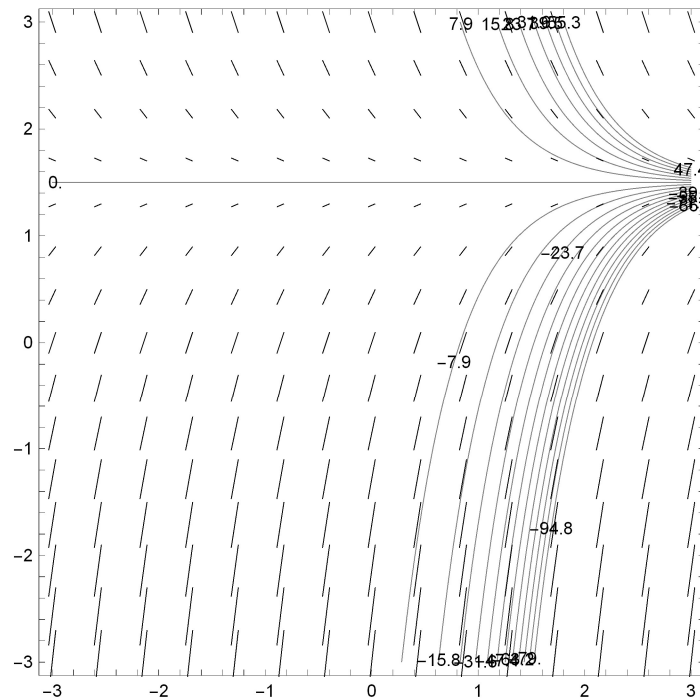
```
(Debug) In[ ]:= campoDirecao[x_, y_] := {1, 3 - 2 y}
```

```
(Debug) In[ ]:= contornosC1 = ContourPlot[c1[x, y], {x, -3, 3}, {y, -3, 3},  
ContourShading → False, Contours → 20, PlotPoints → 50, ContourLabels → True];
```

```
(Debug) In[ ]:= streamDir = StreamPlot[campoDirecao[x, y], {x, -3, 3}, {y, -3, 3}];
```

```
(Debug) In[ ]:= vectorDir = VectorPlot[campoDirecao[x, y],  
{x, -3, 3}, {y, -3, 3}, VectorStyle → {Arrowheads[0], Black}];
```

```
(Debug) In[ ]:= Show[contornosC1, vectorDir]
```



```
(Debug) Out[•]=
```

Exercício 2

$$y' = 2y - 3$$

```
(Debug) In[*]:= solucaoDif1 = DSolve[y' [x] == 2 y[x] - 3, y[x], x]
```

$$(Debug) Out[*]:= \left\{ \left\{ y[x] \rightarrow \frac{3}{2} + e^{2x} C[1] \right\} \right\}$$

```
(Debug) In[*]:= solveC1a = Solve[y == solucaoDif1[[1, 1, 2]], C[1]]
```

$$(Debug) Out[*]:= \left\{ \left\{ C[1] \rightarrow \frac{1}{2} e^{-2x} (-3 + 2 y) \right\} \right\}$$

```
(Debug) In[*]:= c1a[x_, y_] := solveC1a[[1, 1, 2]]

(Debug) In[*]:= campoDirecao1[x_, y_] := {1, 2 y - 3}

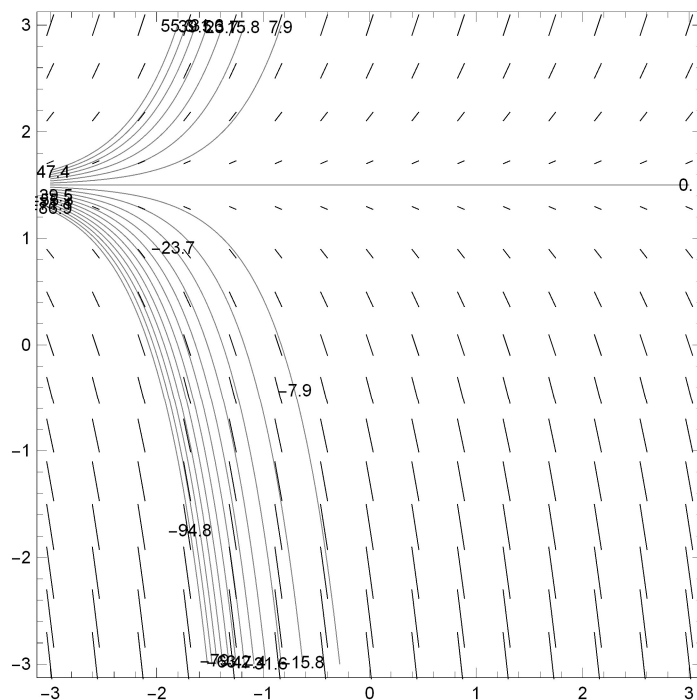
(Debug) In[*]:= contornosC1a = ContourPlot[c1a[x, y], {x, -3, 3}, {y, -3, 3},
      ContourShading → False, Contours → 20, PlotPoints → 50, ContourLabels → True];

(Debug) In[*]:= streamDir1 = StreamPlot[campoDirecao1[x, y], {x, -3, 3}, {y, -3, 3}];

(Debug) In[*]:= vectorDir1 = VectorPlot[campoDirecao1[x, y],
      {x, -3, 3}, {y, -3, 3}, VectorStyle → {Arrowheads[0], Black}];

(Debug) In[*]:= Show[contornosC1a, vectorDir1]
```

```
(Debug) Out[*]:=
```



Exercício 3

$$y' = 3 + 2y$$

```
(Debug) In[*]:= solveDif2 = DSolve[y'[x] == 3 + 2 y[x], y[x], x];

(Debug) In[*]:= solvec1b = Solve[y == solveDif2[[1, 1, 2]], C[1]];

(Debug) In[*]:= c1b[x_, y_] := solvec1b[[1, 1, 2]]

(Debug) In[*]:= campoDirecao2[x_, y_] := {1, 3 + 2 y}

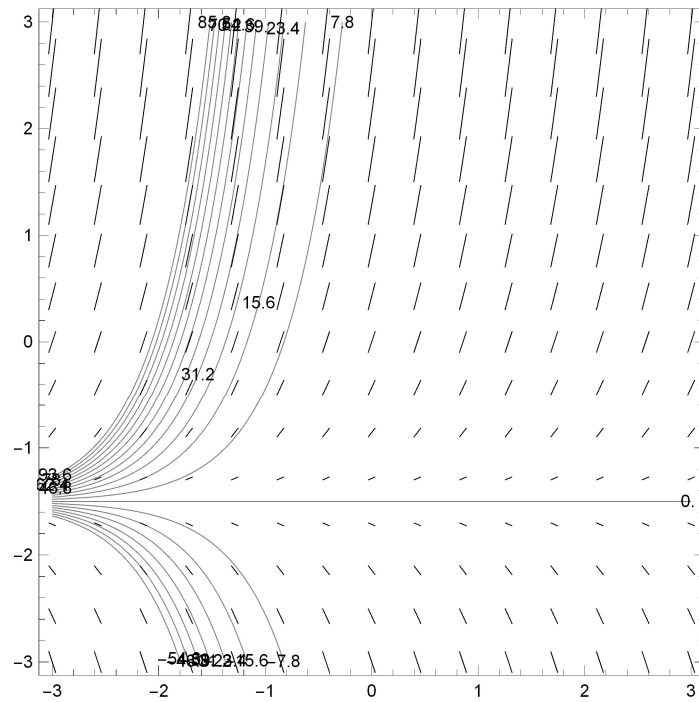
(Debug) In[*]:= contornosC1b = ContourPlot[c1b[x, y], {x, -3, 3}, {y, -3, 3},
      ContourShading → False, Contours → 20, PlotPoints → 50, ContourLabels → True];

(Debug) In[*]:= streamDir2 = StreamPlot[campoDirecao2[x, y], {x, -3, 3}, {y, -3, 3}];

(Debug) In[*]:= vectorDir2 = VectorPlot[campoDirecao2[x, y],
      {x, -3, 3}, {y, -3, 3}, VectorStyle → {Arrowheads[0], Black}];
```

```
(Debug) In[ ]:= Show[contornosC1b, vectorDir2]
```

```
(Debug) Out[ ]:=
```



Exercício 4

$$y' = -1 - 2y$$

```
(Debug) In[ ]:= solveDif3 = DSolve[y'[x] == -1 - 2 y[x], y[x], x];
```

```
(Debug) In[ ]:= solvec1c = Solve[y == solveDif3[[1, 1, 2]], C[1]];
```

```
(Debug) In[ ]:= c1c[x_, y_] := solvec1c[[1, 1, 2]]
```

```
(Debug) In[ ]:= campoDirecao3[x_, y_] := {1, -1 - 2 y}
```

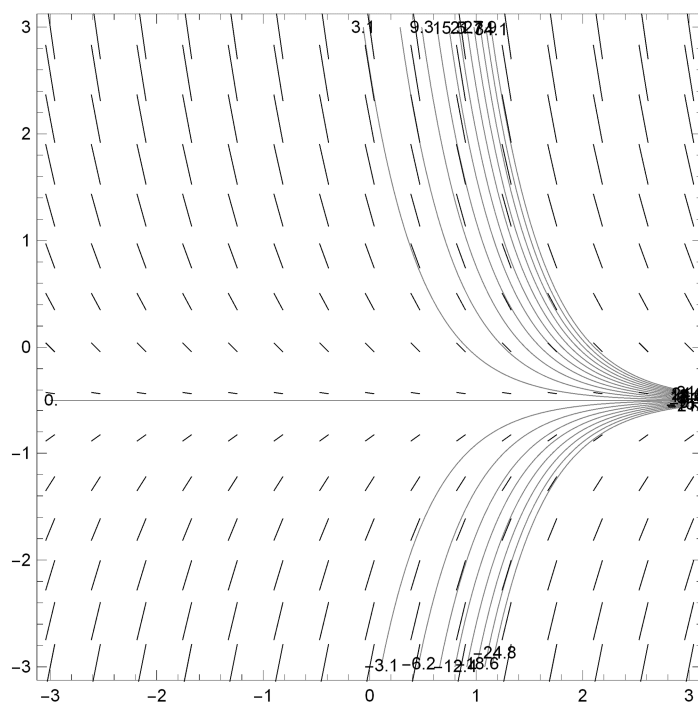
```
(Debug) In[ ]:= contornosC1c = ContourPlot[c1c[x, y], {x, -3, 3}, {y, -3, 3},
  ContourShading -> False, Contours -> 20, PlotPoints -> 50, ContourLabels -> True];
```

```
(Debug) In[ ]:= streamDir3 = StreamPlot[campoDirecao3[x, y], {x, -3, 3}, {y, -3, 3}];
```

```
(Debug) In[ ]:= vectorDir3 = VectorPlot[campoDirecao3[x, y],
  {x, -3, 3}, {y, -3, 3}, VectorStyle -> {Arrowheads[0], Black}];
```

```
(Debug) In[ ]:= Show[contornosC1c, vectorDir3]
```

```
(Debug) Out[ ]:=
```



Exercício 5

$$y' = 1 + 2y$$

```
(Debug) In[ ]:= solveDif4 = DSolve[y'[x] == 1 + 2 y[x], y[x], x];
```

```
(Debug) In[ ]:= solvec1d = Solve[y == solveDif4[[1, 1, 2]], C[1]];
```

```
(Debug) In[ ]:= c1d[x_, y_] := solvec1d[[1, 1, 2]]
```

```
(Debug) In[ ]:= campoDirecao4[x_, y_] := {1, 1 + 2 y}
```

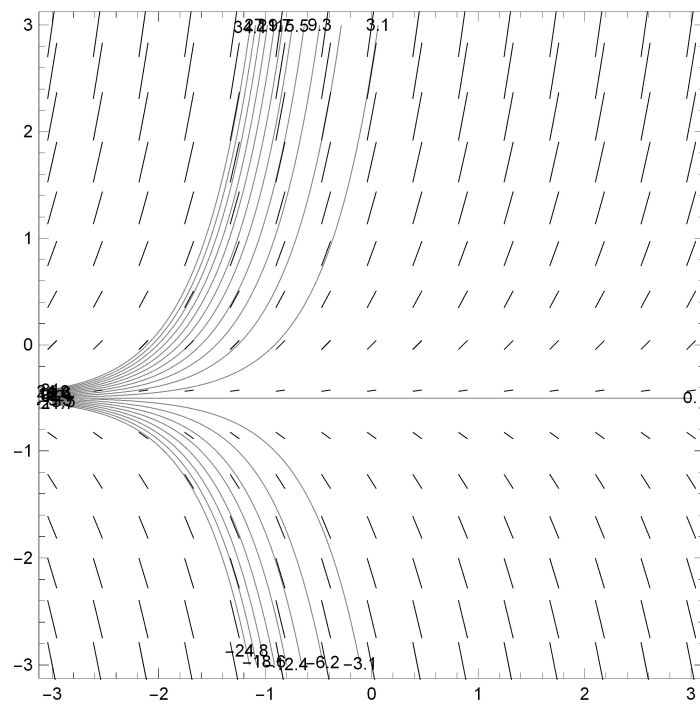
```
(Debug) In[ ]:= contornosC1d = ContourPlot[c1d[x, y], {x, -3, 3}, {y, -3, 3},
  ContourShading -> False, Contours -> 20, PlotPoints -> 50, ContourLabels -> True];
```

```
(Debug) In[ ]:= streamDir4 = StreamPlot[campoDirecao4[x, y], {x, -3, 3}, {y, -3, 3}];
```

```
(Debug) In[ ]:= vectorDir4 = VectorPlot[campoDirecao4[x, y],
  {x, -3, 3}, {y, -3, 3}, VectorStyle -> {Arrowheads[0], Black}];
```

```
(Debug) In[ ]:= Show[contornosC1d, vectorDir4]
```

```
(Debug) Out[ ]:=
```



Exercício 6

$$y' = y + 2$$

```
(Debug) In[ ]:= solveDif5 = DSolve[y'[x] == y[x] + 2, y[x], x];
```

```
(Debug) In[ ]:= solvec1e = Solve[y == solveDif5[[1, 1, 2]], C[1]];
```

```
(Debug) In[ ]:= c1e[x_, y_] := solvec1e[[1, 1, 2]]
```

```
(Debug) In[ ]:= campoDirecao5[x_, y_] := {1, y + 2}
```

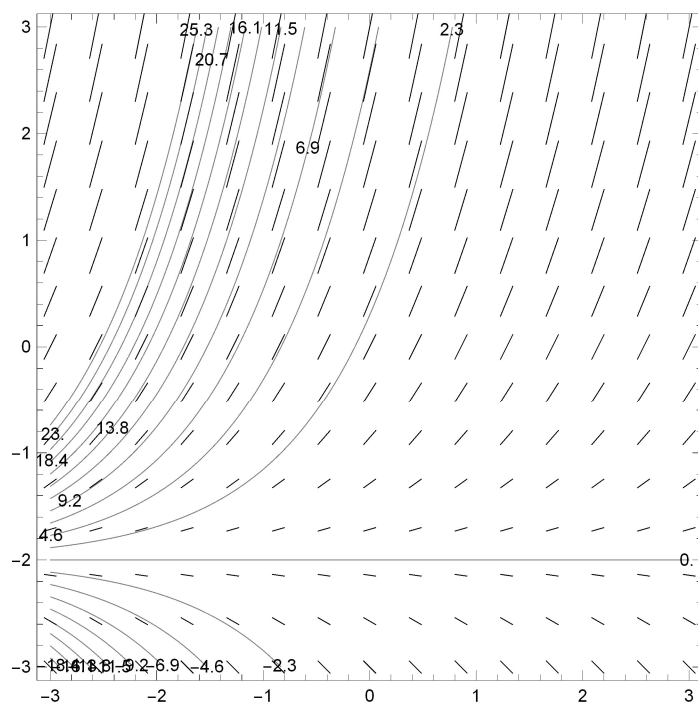
```
(Debug) In[ ]:= contornosC1e = ContourPlot[c1e[x, y], {x, -3, 3}, {y, -3, 3},
  ContourShading -> False, Contours -> 20, PlotPoints -> 50, ContourLabels -> True];
```

```
(Debug) In[ ]:= streamDir5 = StreamPlot[campoDirecao5[x, y], {x, -3, 3}, {y, -3, 3}];
```

```
(Debug) In[ ]:= vectorDir5 = VectorPlot[campoDirecao5[x, y],
  {x, -3, 3}, {y, -3, 3}, VectorStyle -> {Arrowheads[0], Black}];
```

```
(Debug) In[ ]:= Show[contornosC1e, vectorDir5]
```

```
(Debug) Out[ ]:=
```

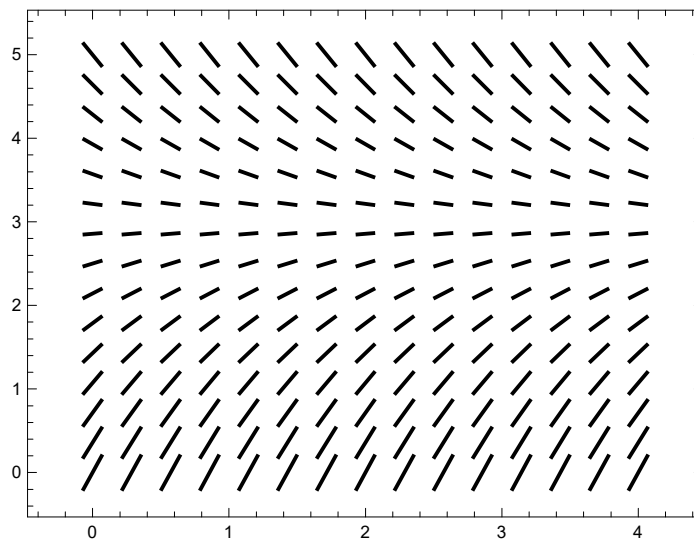


Exercícios do 7 ao 10

Exercício 7

Todas as soluções tendem a $y = 3$

```
(Debug) In[ ]:= VectorPlot[{1, -y + 3}, {x, 0, 4}, {y, 0, 5},  
VectorStyle -> {Thick, Arrowheads[0], Black}, AspectRatio -> 3 / 4]
```

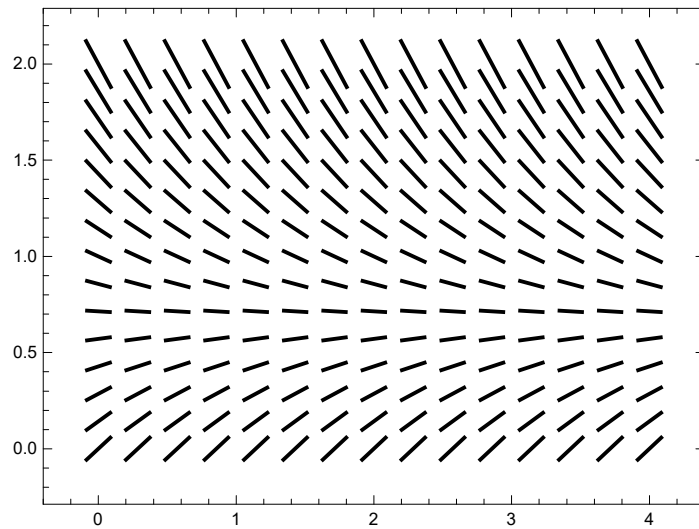


Exercício 8

Todas as soluções tendem a $y = 2/3$

```
(Debug) In[ ]:= VectorPlot[{1, -y + 2 / 3}, {x, 0, 4}, {y, 0, 2},  
VectorStyle -> {Thick, Arrowheads[0], Black}, AspectRatio -> 3 / 4]
```

```
(Debug) Out[ ]:=
```

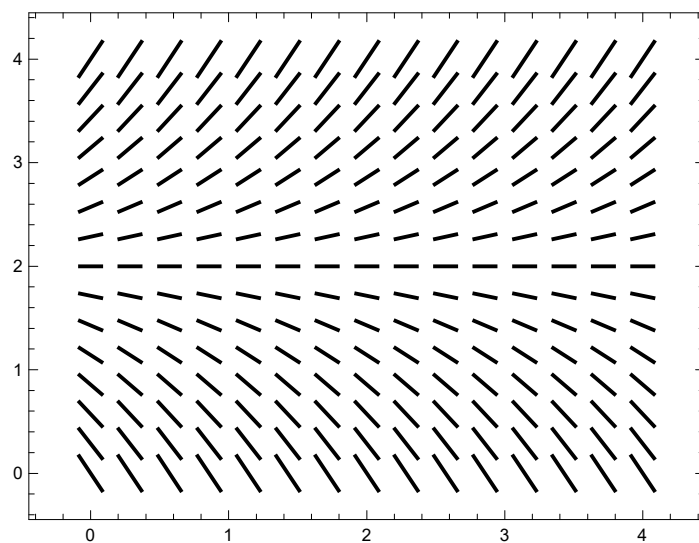


Exercício 9

Todas as outras soluções se afastam de $y = 2$

```
(Debug) In[ ]:= VectorPlot[{1, y - 2}, {x, 0, 4}, {y, 0, 4},  
VectorStyle -> {Thick, Arrowheads[0], Black}, AspectRatio -> 3 / 4]
```

```
(Debug) Out[ ]:=
```

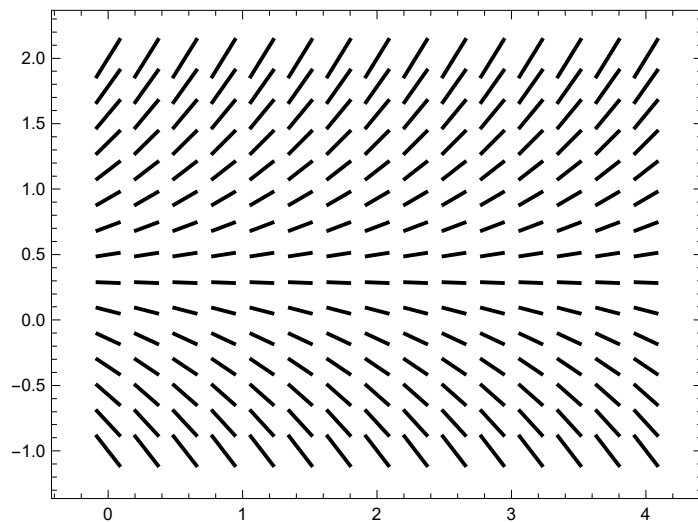


Exercício 10

Todas as outras soluções se afastam de $y = 1/3$

```
(Debug) In[ ]:= VectorPlot[{1, y - 1 / 3}, {x, 0, 4}, {y, -1, 2},
  VectorStyle -> {Thick, Arrowheads[0], Black}, AspectRatio -> 3 / 4]
```

```
(Debug) Out[ ]:=
```



Exercício 11

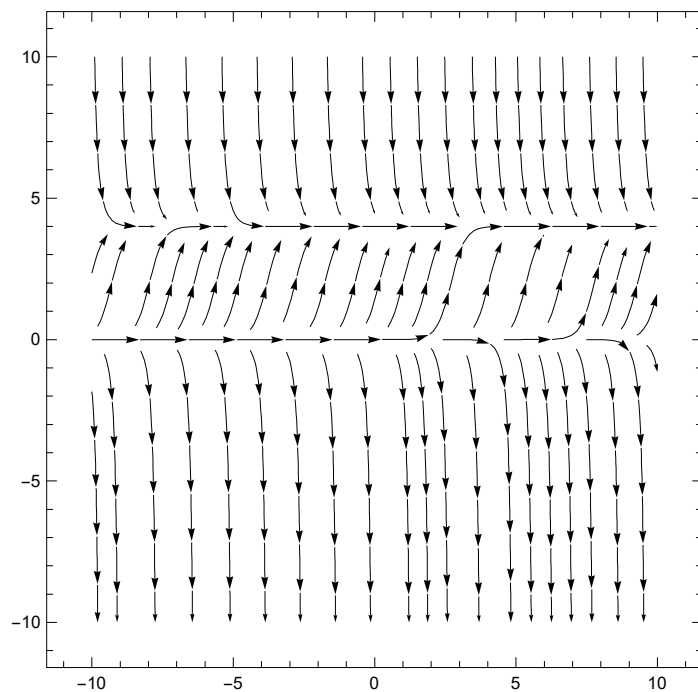
$$y' = y(4 - y)$$

```
(Debug) In[ ]:= solveDif11 = DSolve[y' [x] == y[x] (4 - y[x]), y[x], x];
```

```
(Debug) In[ ]:= field11[x_, y_] := {1, y (4 - y) }
```

```
(Debug) In[ ]:= stream11 = StreamPlot[field11[x, y], {x, -10, 10}, {y, -10, 10}, StreamStyle -> {Black}]
```

```
(Debug) Out[ ]:=
```



Exercício 12

$$y' = -y(5 - y)$$

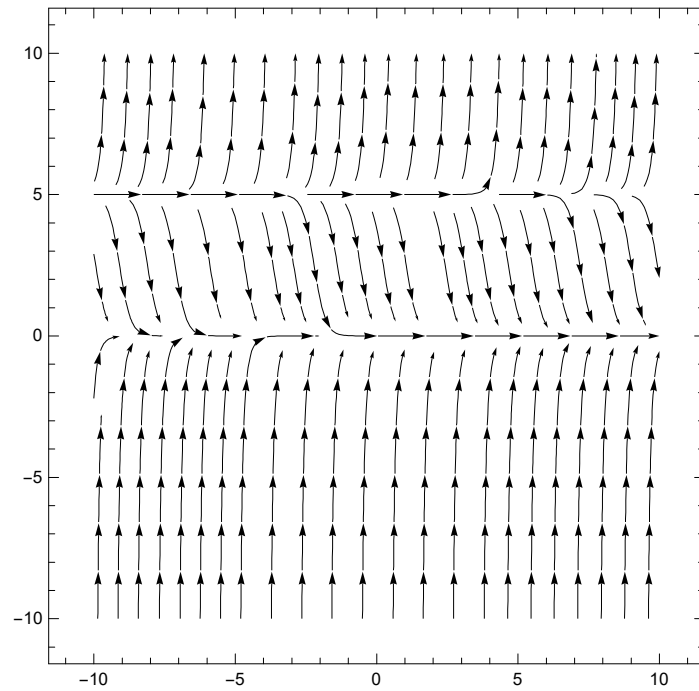
```
(Debug) In[*]:= solveDif12 = DSolve[y'[x] == -y[x] (5 - y[x]), y[x], x]
```

```
(Debug) Out[*]:= {{y[x] -> \frac{5}{1 + e^{5 x + 5 C[1]}}}}
```

```
(Debug) In[*]:= field12[x_, y_] := {1, -y (5 - y)}
```

```
(Debug) In[*]:= stream12 = StreamPlot[field12[x, y], {x, -10, 10}, {y, -10, 10}, StreamStyle -> {Black}]
```

```
(Debug) Out[*]:=
```



Exercício 13

$$y' = y^2$$

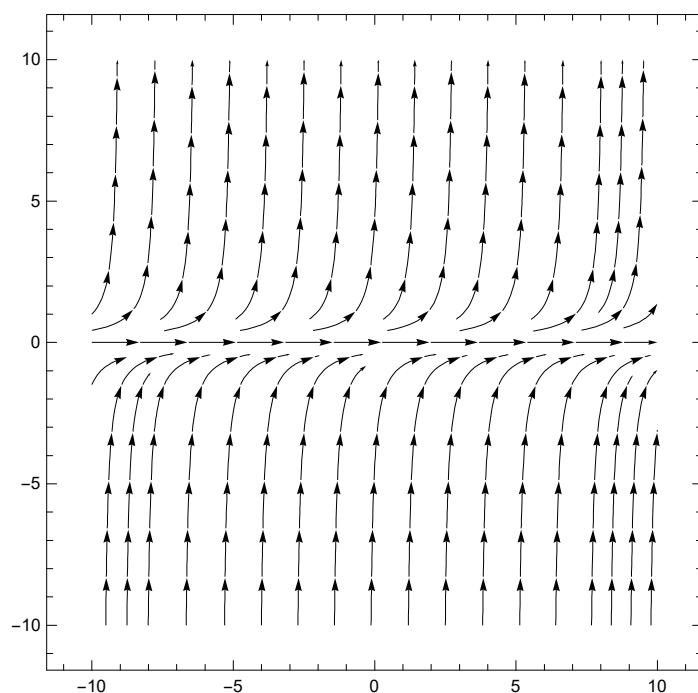
```
(Debug) In[*]:= solveDif13 = DSolve[y'[x] == y[x]^2, y[x], x]
```

```
(Debug) Out[*]:= {{y[x] -> \frac{1}{-x - C[1]}}}
```

```
(Debug) In[*]:= field13[x_, y_] := {1, y^2}
```

```
(Debug) In[ ]:= stream13 = StreamPlot[field13[x, y], {x, -10, 10}, {y, -10, 10}, StreamStyle -> {Black}]
```

```
(Debug) Out[ ]:=
```



Exercício 14

$$y' = y(y - 2)^2$$

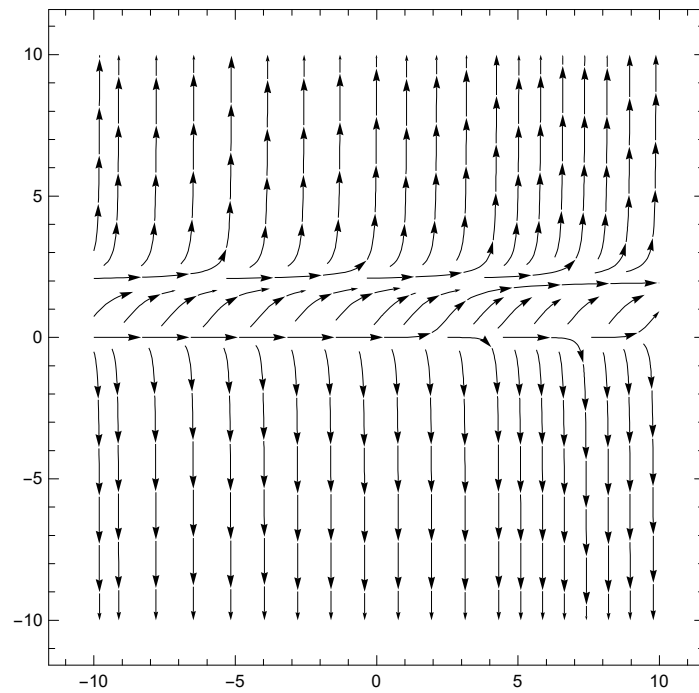
```
(Debug) In[ ]:= solveDif14 = DSolve[y'[x] == y[x] (y[x] - 2)^2, y[x], x]
```

```
(Debug) Out[ ]:= {{y[x] -> InverseFunction[1/4 (-Log[-2 + #1] + Log[#1] - 2/(-2 + #1)) &][x + C[1]]}}
```

```
(Debug) In[ ]:= field14[x_, y_] := {1, y (y - 2)^2}
```

```
(Debug) In[ ]:= stream14 = StreamPlot[field14[x, y], {x, -10, 10}, {y, -10, 10}, StreamStyle -> {Black}]
```

```
(Debug) Out[ ]:=
```

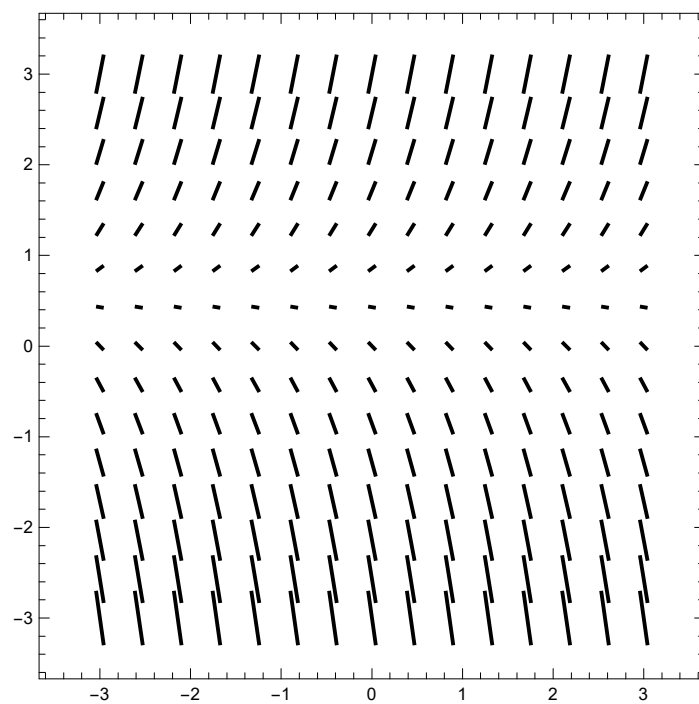


Campos de direção para os exercícios do 15 ao 20

(a)

```
(Debug) In[ ]:= streamA = VectorPlot[{1, 2 y - 1}, {x, -3, 3},  
{y, -3, 3}, VectorStyle -> {Arrowheads[0], Black, Thick}]
```

```
(Debug) Out[ ]:=
```

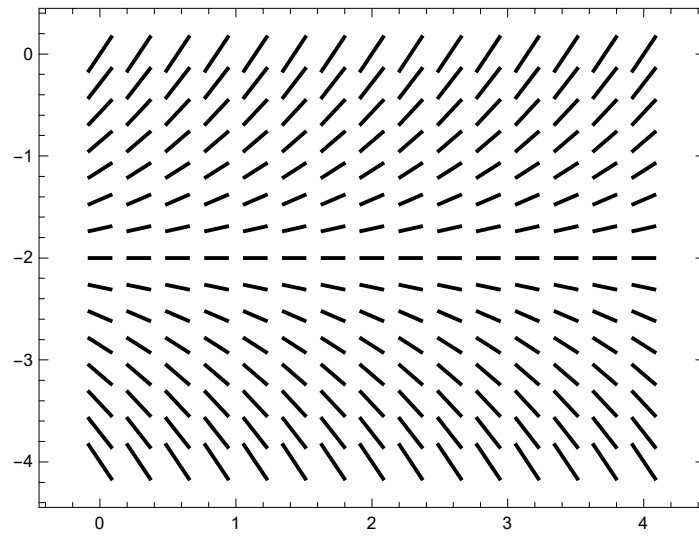


```
(Debug) In[ ]:=
```

(b) FIG 1.1.8

```
(Debug) In[ ]:= streamB = VectorPlot[{1, 2 + y}, {x, 0, 4}, {y, -4, 0},
VectorStyle -> {Arrowheads[0], Black, Thick}, AspectRatio -> 3 / 4]
```

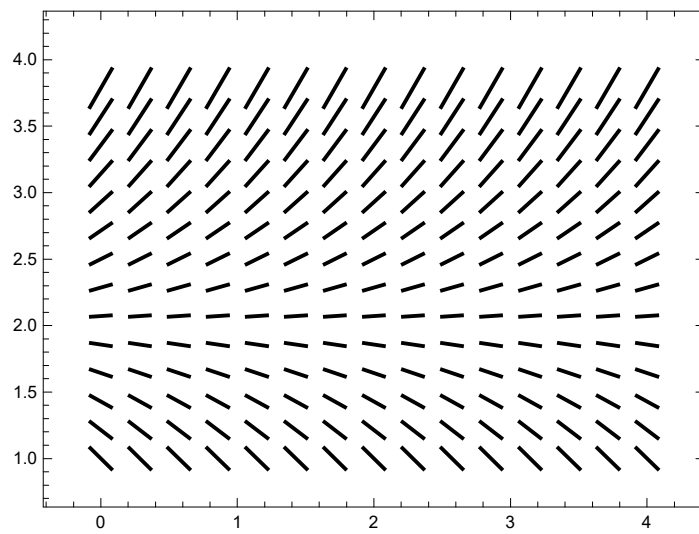
```
(Debug) Out[ ]:=
```



(c) FIG 1.1.6

```
(Debug) In[ ]:= streamC = VectorPlot[{1, y - 2}, {x, 0, 4}, {y, 1, 4},
VectorStyle -> {Arrowheads[0], Black, Thick}, AspectRatio -> 3 / 4]
```

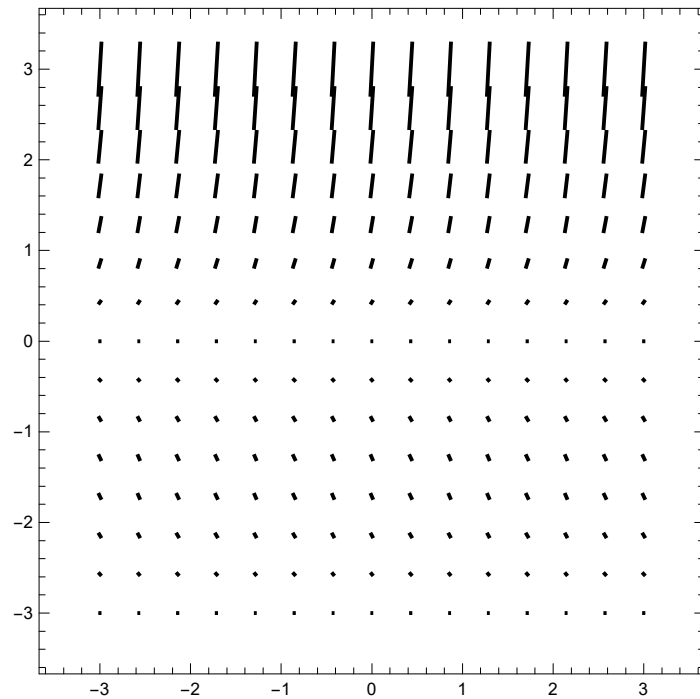
```
(Debug) Out[ ]:=
```



(d)

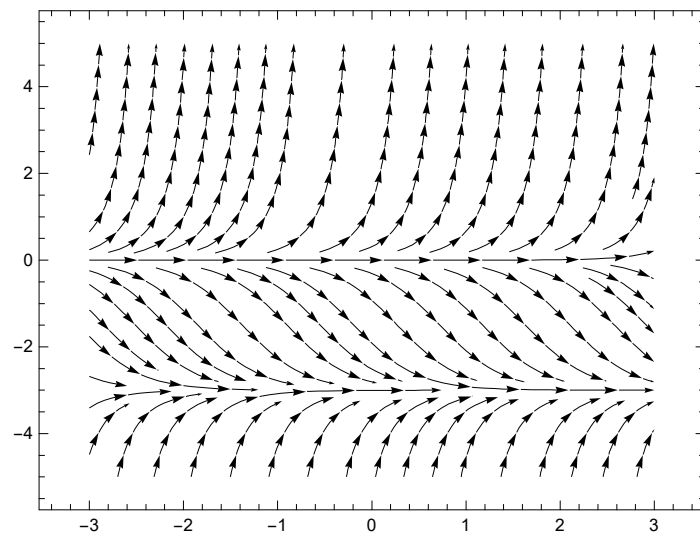
```
(Debug) In[ ]:= vectorD = VectorPlot[{1, y (y + 3)}, {x, -3, 3},
{y, -3, 3}, VectorStyle -> {Arrowheads[0], Black, Thick}]
```

```
(Debug) Out[ ]:=
```



```
(Debug) In[ ]:= streamD = StreamPlot[{1, y (y + 3)}, {x, -3, 3},
{y, -5, 5}, AspectRatio -> 3 / 4, StreamStyle -> {Black}]
```

```
(Debug) Out[ ]:=
```

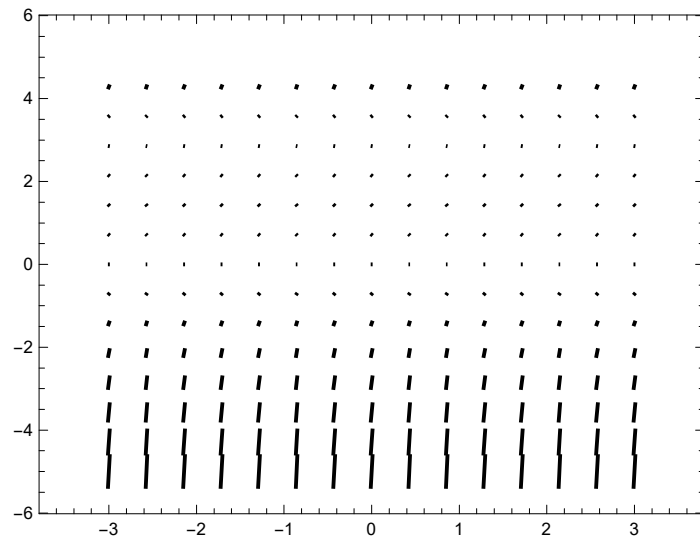


(e) FIG 1.1.10

```
(Debug) In[ ]:= vectorE = VectorPlot[{1, y (y - 3)}, {x, -3, 3}, {y, -5, 5},  

VectorStyle -> {Arrowheads[0], Black, Thick}, AspectRatio -> 3 / 4]
```

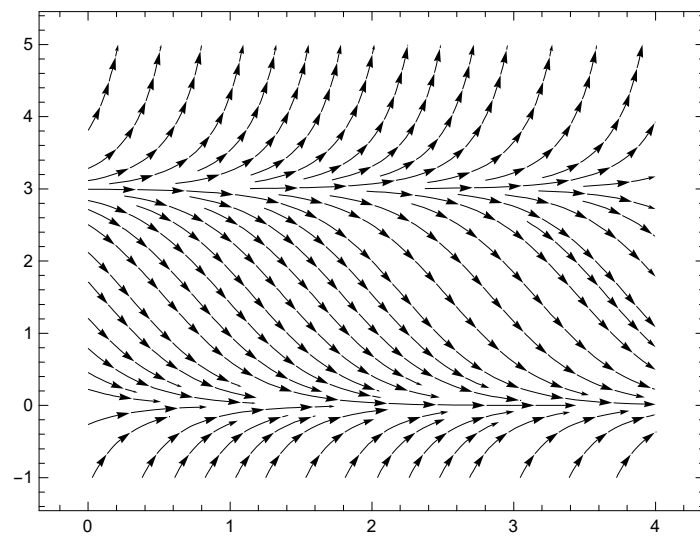
```
(Debug) Out[ ]:=
```



```
(Debug) In[ ]:= streamE = StreamPlot[{1, y (y - 3)}, {x, 0, 4},  

{y, -1, 5}, StreamStyle -> Black, AspectRatio -> 3 / 4]
```

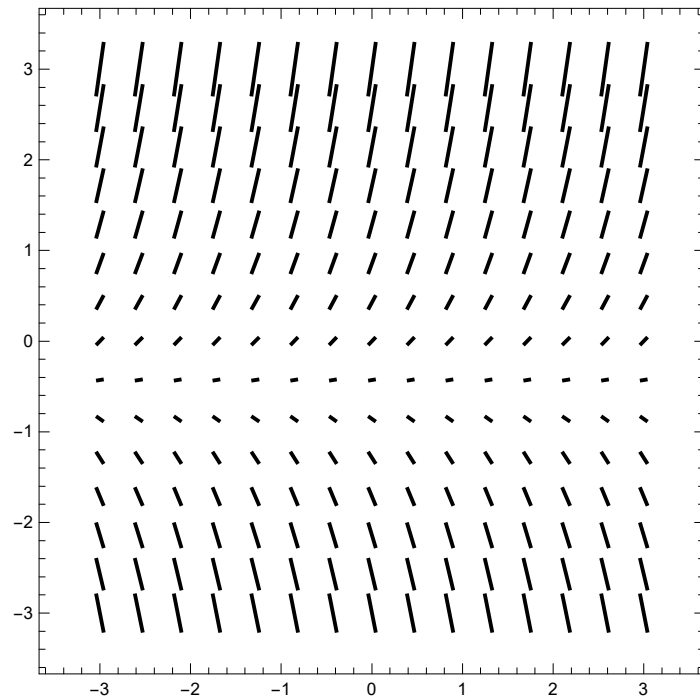
```
(Debug) Out[ ]:=
```



(f)

```
(Debug) In[ ]:= streamF = VectorPlot[{1, 2 y + 1}, {x, -3, 3},
  {y, -3, 3}, VectorStyle → {Arrowheads[0], Black, Thick}]
```

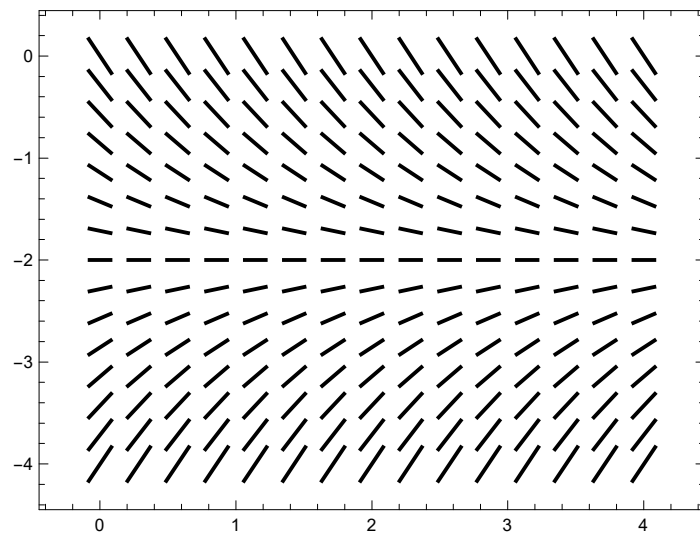
```
(Debug) Out[ ]:=
```



(g) FIG 1.1.7

```
(Debug) In[ ]:= streamG = VectorPlot[{1, -2 - y}, {x, 0, 4}, {y, -4, 0},
  VectorStyle → {Arrowheads[0], Black, Thick}, AspectRatio → 3 / 4]
```

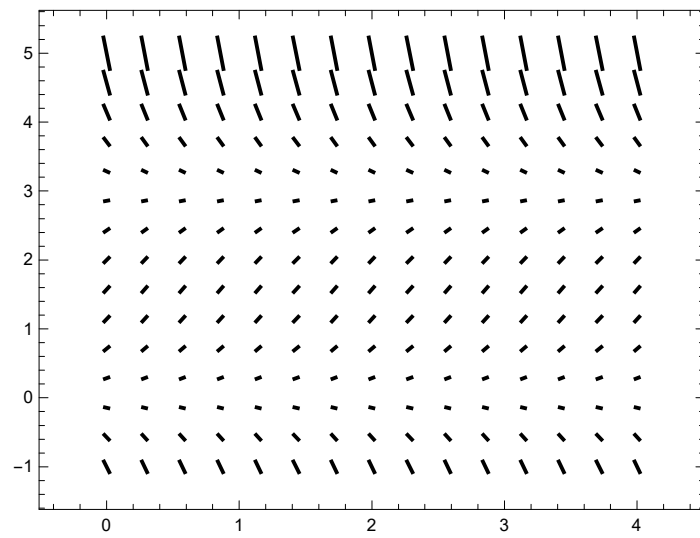
```
(Debug) Out[ ]:=
```



(h) FIG 1.1.9

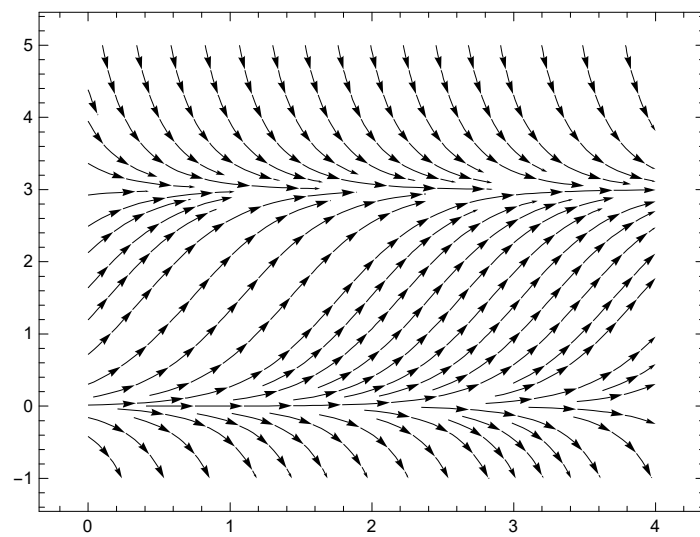
```
(Debug) In[ ]:= vectorH = VectorPlot[{1, y (3 - y)}, {x, 0, 4}, {y, -1, 5},
VectorStyle -> {Arrowheads[0], Black, Thick}, AspectRatio -> 3 / 4]
```

```
(Debug) Out[ ]:=
```



```
(Debug) In[ ]:= streamH = StreamPlot[{1, y (3 - y)}, {x, 0, 4},
{y, -1, 5}, AspectRatio -> 3 / 4, StreamStyle -> {Black}]
```

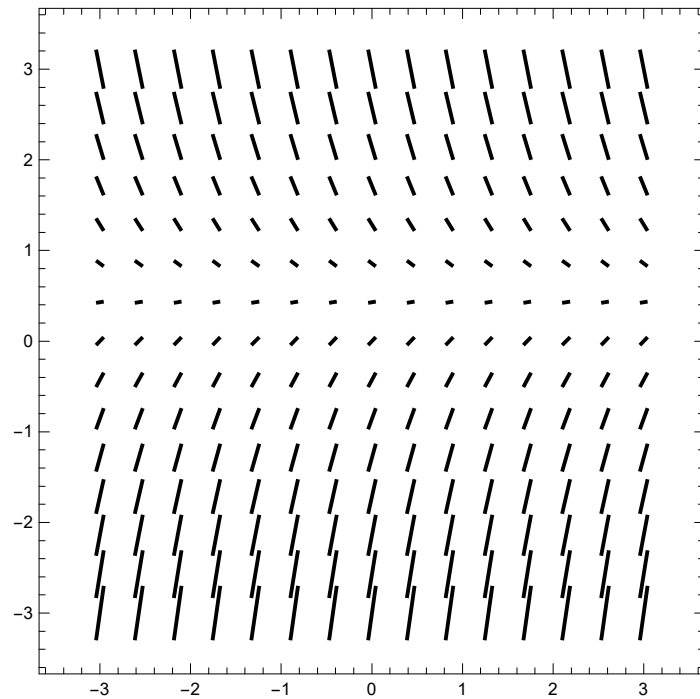
```
(Debug) Out[ ]:=
```



(i)


```
(Debug) In[ ]:= streamI = VectorPlot[{1, 1 - 2 y}, {x, -3, 3},
  {y, -3, 3}, VectorStyle -> {Arrowheads[0], Black, Thick}]
```

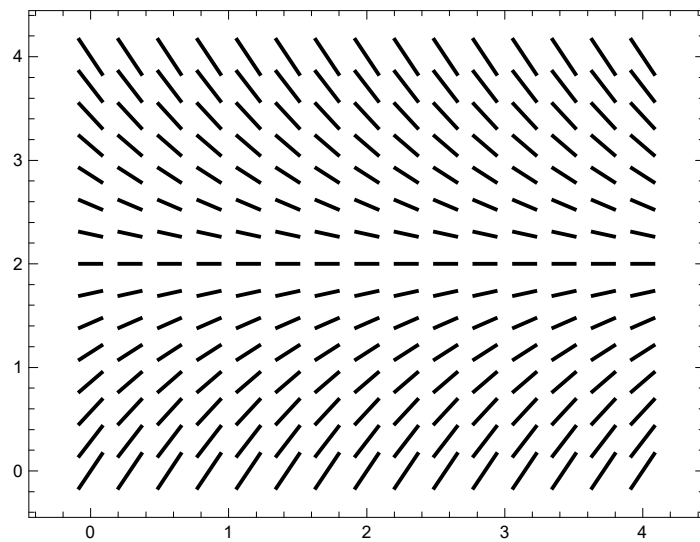
```
(Debug) Out[ ]:=
```



(j) FIG 1.1.5

```
(Debug) In[ ]:= streamJ = VectorPlot[{1, 2 - y}, {x, 0, 4}, {y, 0, 4},
  VectorStyle -> {Arrowheads[0], Black, Thick}, AspectRatio -> 3 / 4]
```

```
(Debug) Out[ ]:=
```



```
(Debug) In[ ]:=
```