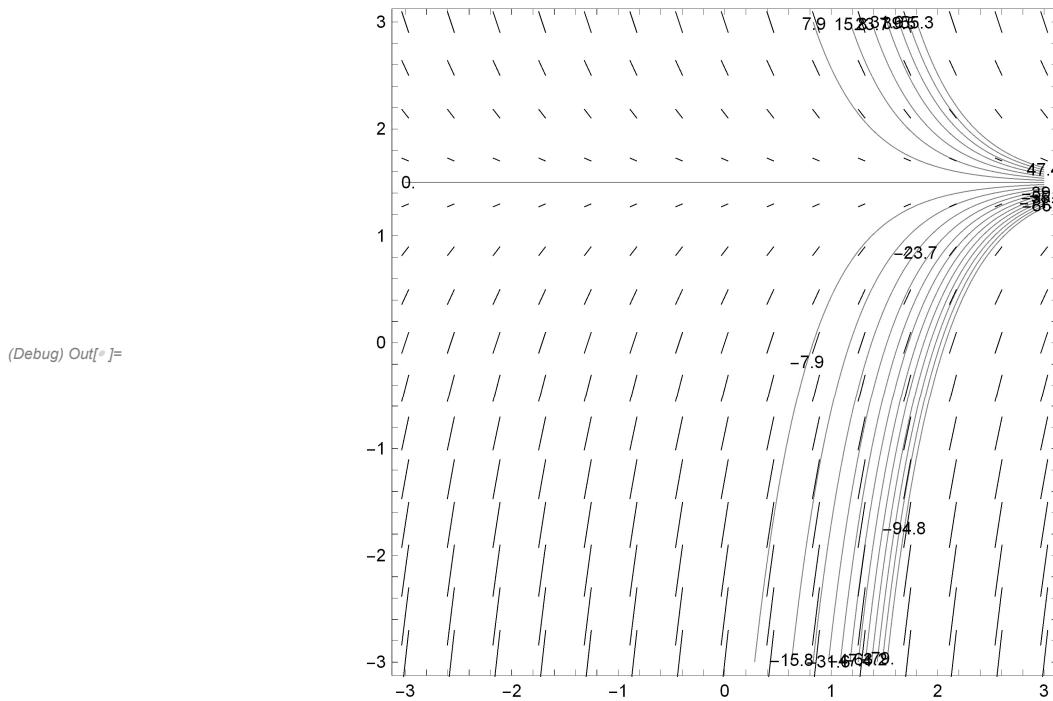


## Exercício 1

$$y' = 3 - 2y$$

```
(Debug) In[1]:= solucaoDif = DSolve[y'[x] == 3 - 2 y[x], y[x], x];
(Debug) In[2]:= solveC1 = Solve[y == solucaoDif[[1, 1, 2]], C[1]];
(Debug) In[3]:= c1[x_, y_] := solveC1[[1, 1, 2]];
(Debug) In[4]:= campoDirecao[x_, y_] := {1, 3 - 2 y};
(Debug) In[5]:= contornosC1 = ContourPlot[c1[x, y], {x, -3, 3}, {y, -3, 3},
    ContourShading → False, Contours → 20, PlotPoints → 50, ContourLabels → True];
(Debug) In[6]:= streamDir = StreamPlot[campoDirecao[x, y], {x, -3, 3}, {y, -3, 3}];
(Debug) In[7]:= vectorDir = VectorPlot[campoDirecao[x, y],
    {x, -3, 3}, {y, -3, 3}, VectorStyle → {Arrowheads[0], Black}];
(Debug) In[8]:= Show[contornosC1, vectorDir]
```



## Exercício 2

$$y' = 2y - 3$$

```
(Debug) In[1]:= solucaoDif1 = DSolve[y'[x] == 2 y[x] - 3, y[x], x]
(Debug) Out[1]= \left\{ \left\{ y[x] \rightarrow \frac{3}{2} + e^{2x} C[1] \right\} \right\}
(Debug) In[2]:= solveC1a = Solve[y == solucaoDif1[[1, 1, 2]], C[1]]
(Debug) Out[2]= \left\{ \left\{ C[1] \rightarrow \frac{1}{2} e^{-2x} (-3 + 2y) \right\} \right\}
```

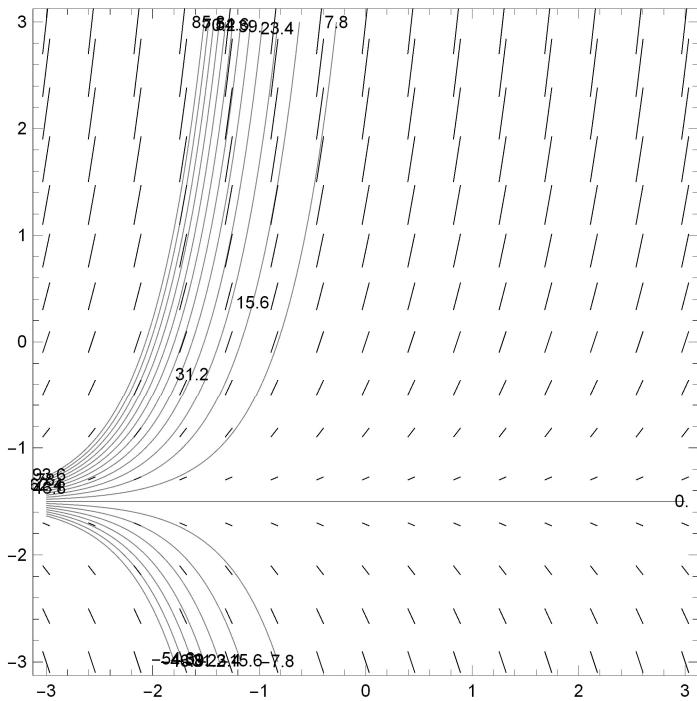
```
(Debug) In[°]:= c1a[x_, y_] := solveC1a[[1, 1, 2]]
(Debug) In[°]:= campoDirecao1[x_, y_] := {1, 2y - 3}
(Debug) In[°]:= contornosC1a = ContourPlot[c1a[x, y], {x, -3, 3}, {y, -3, 3},
                                         ContourShading → False, Contours → 20, PlotPoints → 50, ContourLabels → True];
(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]
```

## Exercício 3

$$y' = 3 + 2y$$

```
(Debug) In[°]:= solveDif2 = DSolve[y'[x] == 3 + 2y[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 + 2y}
(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[<sup>®</sup>] := Show[contornosC1b, vectorDir2]



(Debug) Out[<sup>®</sup>] =

#### Exercício 4

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

(Debug) In[<sup>®</sup>] := solveDif3 = DSolve[y'[x] == -1 - 2 y[x], y[x], x];

(Debug) In[<sup>®</sup>] := solvec1c = Solve[y == solveDif3[[1, 1, 2]], C[1]];

(Debug) In[<sup>®</sup>] := c1c[x\_, y\_] := solvec1c[[1, 1, 2]]

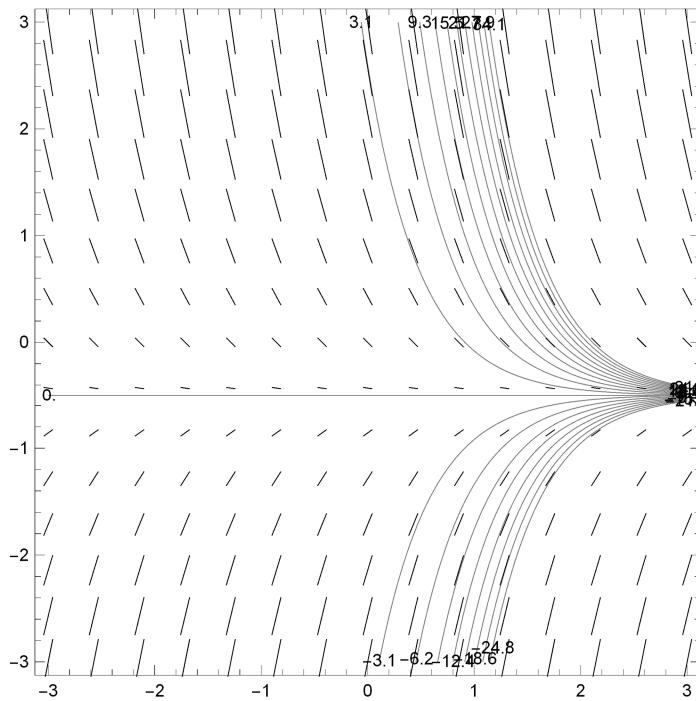
(Debug) In[<sup>®</sup>] := campoDirecao3[x\_, y\_] := {1, -1 - 2 y}

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

(Debug) In[<sup>®</sup>] := streamDir3 = StreamPlot[campoDirecao3[x, y], {x, -3, 3}, {y, -3, 3}];

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

(Debug) In[6]:= Show[contornosC1c, vectorDir3]

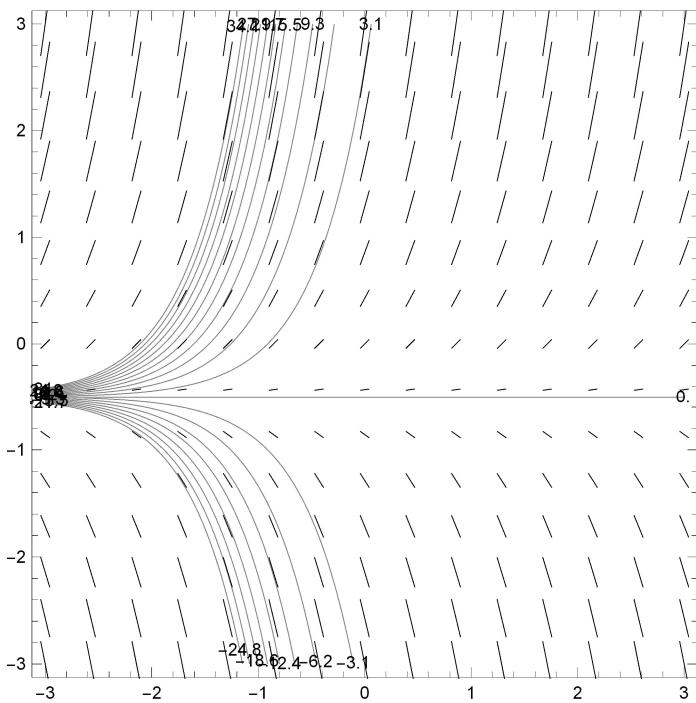


## Exercício 5

$$y' = 1 + 2y$$

```
(Debug) In[7]:= solveDif4 = DSolve[y'[x] == 1 + 2 y[x], y[x], x];
(Debug) In[8]:= solvec1d = Solve[y == solveDif4[[1, 1, 2]], C[1]];
(Debug) In[9]:= c1d[x_, y_] := solvec1d[[1, 1, 2]]
(Debug) In[10]:= campoDirecao4[x_, y_] := {1, 1 + 2 y}
(Debug) In[11]:= contornosC1d = ContourPlot[c1d[x, y], {x, -3, 3}, {y, -3, 3},
    ContourShading → False, Contours → 20, PlotPoints → 50, ContourLabels → True];
(Debug) In[12]:= streamDir4 = StreamPlot[campoDirecao4[x, y], {x, -3, 3}, {y, -3, 3}];
(Debug) In[13]:= vectorDir4 = VectorPlot[campoDirecao4[x, y],
    {x, -3, 3}, {y, -3, 3}, VectorStyle → {Arrowheads[0], Black}];
```

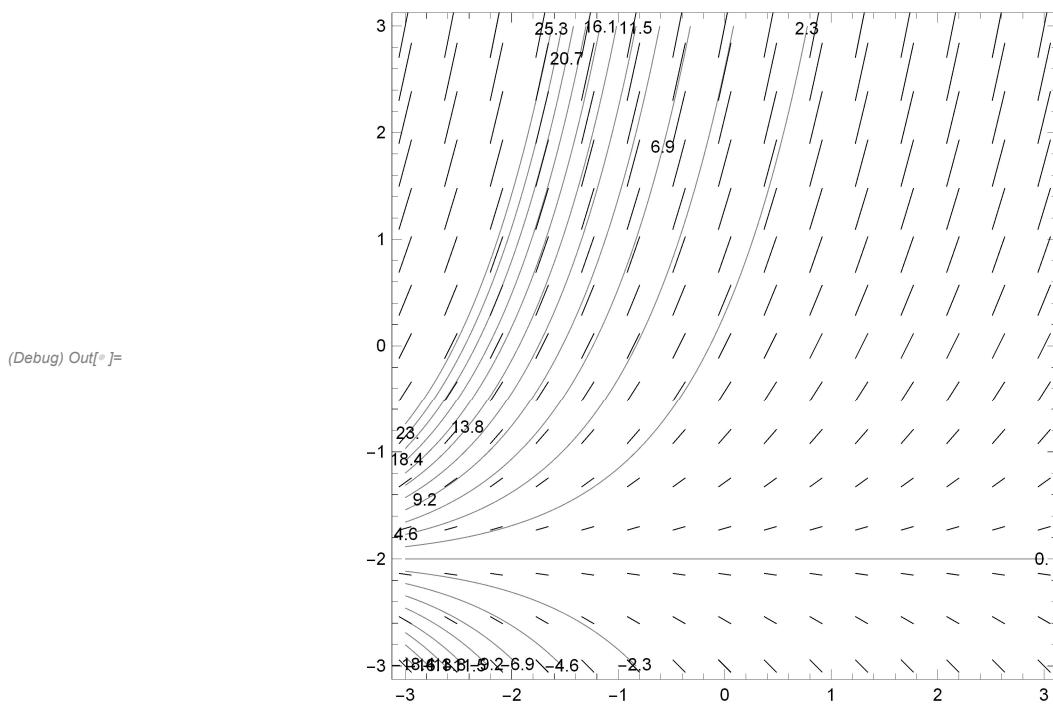
(Debug) In[6]:= **Show[contornosC1d, vectorDir4]**



### Exercício 6

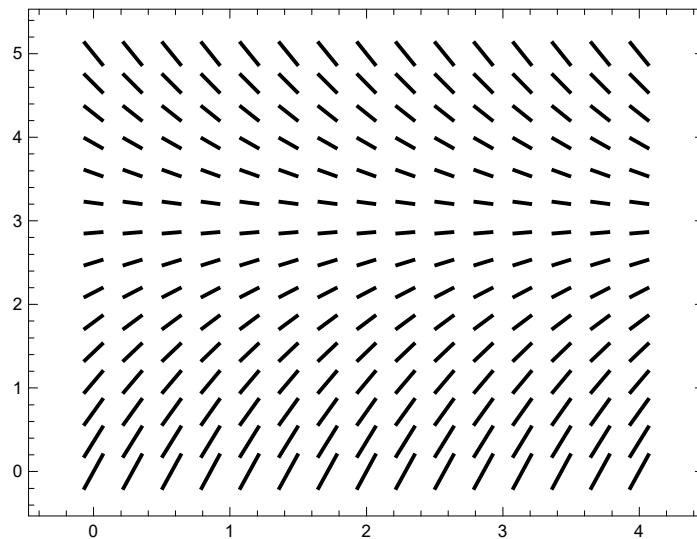
$$y' = y + 2$$

```
(Debug) In[7]:= solveDiff5 = DSolve[y'[x] == y[x] + 2, y[x], x];
(Debug) In[8]:= solveC1e = Solve[y == solveDiff5[[1, 1, 2]], C[1]];
(Debug) In[9]:= c1e[x_, y_] := solveC1e[[1, 1, 2]]
(Debug) In[10]:= campoDirecao5[x_, y_] := {1, y + 2}
(Debug) In[11]:= contornosC1e = ContourPlot[c1e[x, y], {x, -3, 3}, {y, -3, 3},
ContourShading → False, Contours → 20, PlotPoints → 50, ContourLabels → True];
(Debug) In[12]:= streamDir5 = StreamPlot[campoDirecao5[x, y], {x, -3, 3}, {y, -3, 3}];
(Debug) In[13]:= vectorDir5 = VectorPlot[campoDirecao5[x, y],
{x, -3, 3}, {y, -3, 3}, VectorStyle → {Arrowheads[0], Black}];
```

(Debug) In[<sup>®</sup>] := Show[contornosC1e, vectorDir5]

Exercícios do 7 ao 10

Exercício 7

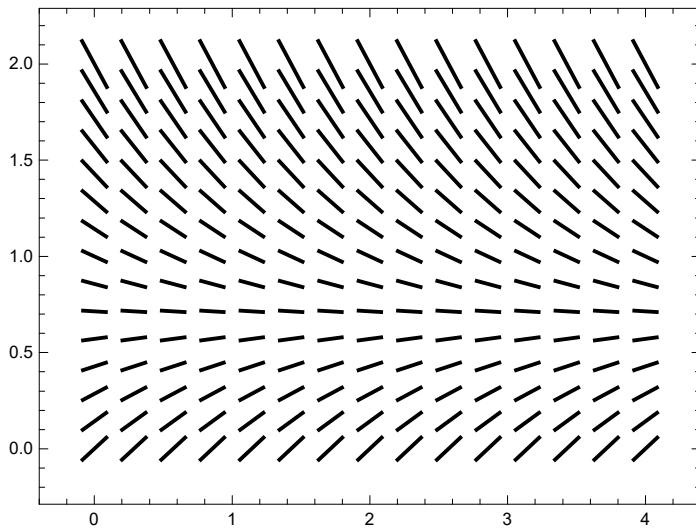
Todas as soluções tendem a  $y = 3$ (Debug) In[<sup>®</sup>] := VectorPlot[{1, -y + 3}, {x, 0, 4}, {y, 0, 5}, VectorStyle -> {Thick, Arrowheads[0], Black}, AspectRatio -> 3 / 4]

Exercício 8

Todas as soluções tendem a  $y = 2/3$

```
(Debug) In[6]:= VectorPlot[{1, -y + 2/3}, {x, 0, 4}, {y, 0, 2},
  VectorStyle -> {Thick, Arrowheads[0], Black}, AspectRatio -> 3/4]
```

(Debug) Out[6]=

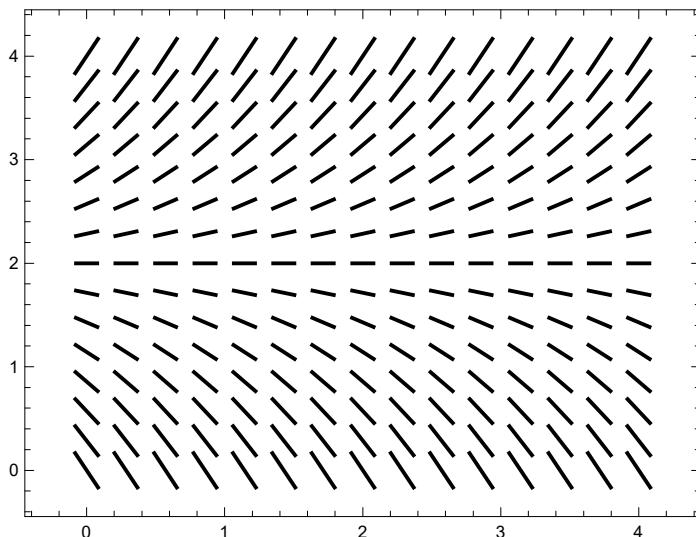


### Exercício 9

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

```
(Debug) In[7]:= VectorPlot[{1, y - 2}, {x, 0, 4}, {y, 0, 4},
  VectorStyle -> {Thick, Arrowheads[0], Black}, AspectRatio -> 3/4]
```

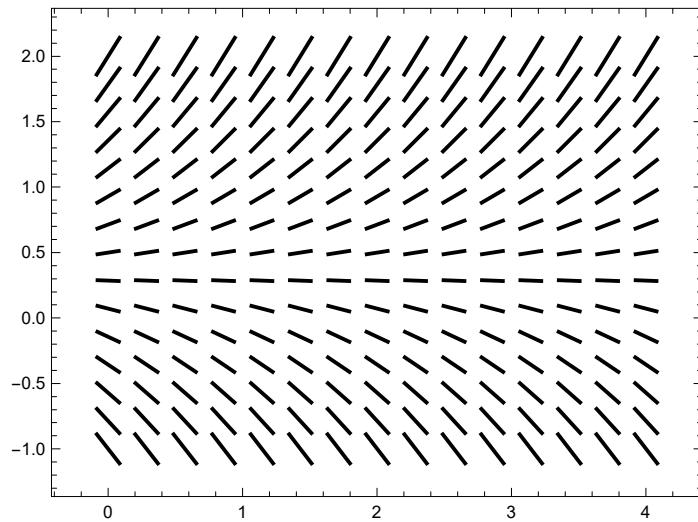
(Debug) Out[7]=



### Exercício 10

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

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



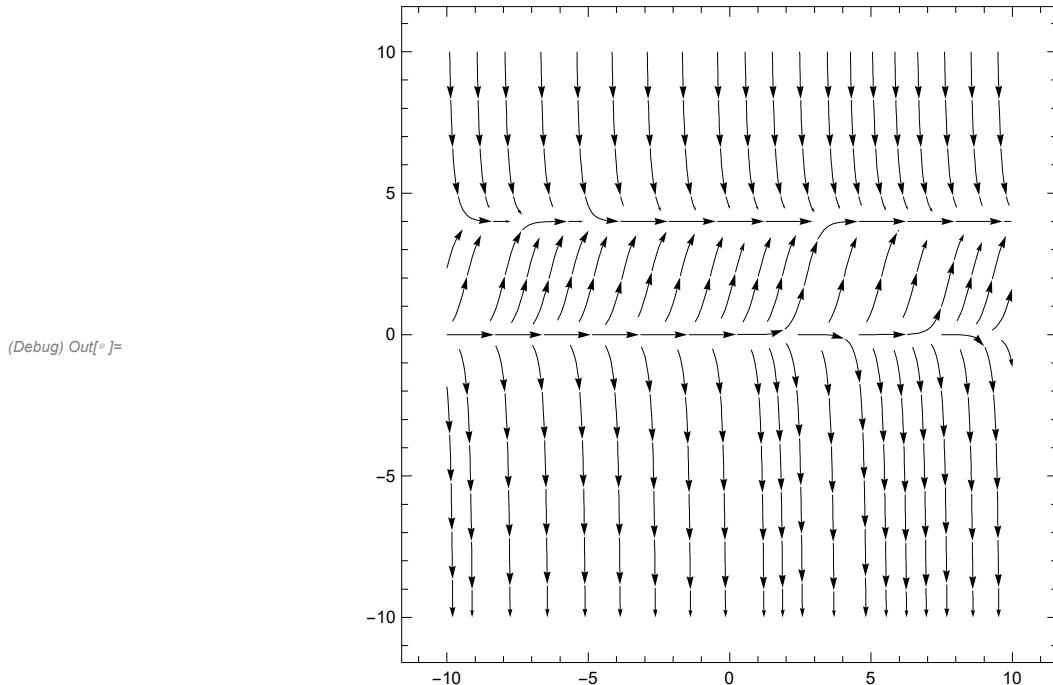
### Exercício 11

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

```
(Debug) In[3]:= solveDif11 = DSolve[y'[x] == y[x] (4 - y[x]), y[x], x];
```

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

```
(Debug) In[5]:= stream11 = StreamPlot[field11[x, y], {x, -10, 10}, {y, -10, 10}, StreamStyle -> {Black}]
```



### Exercício 12

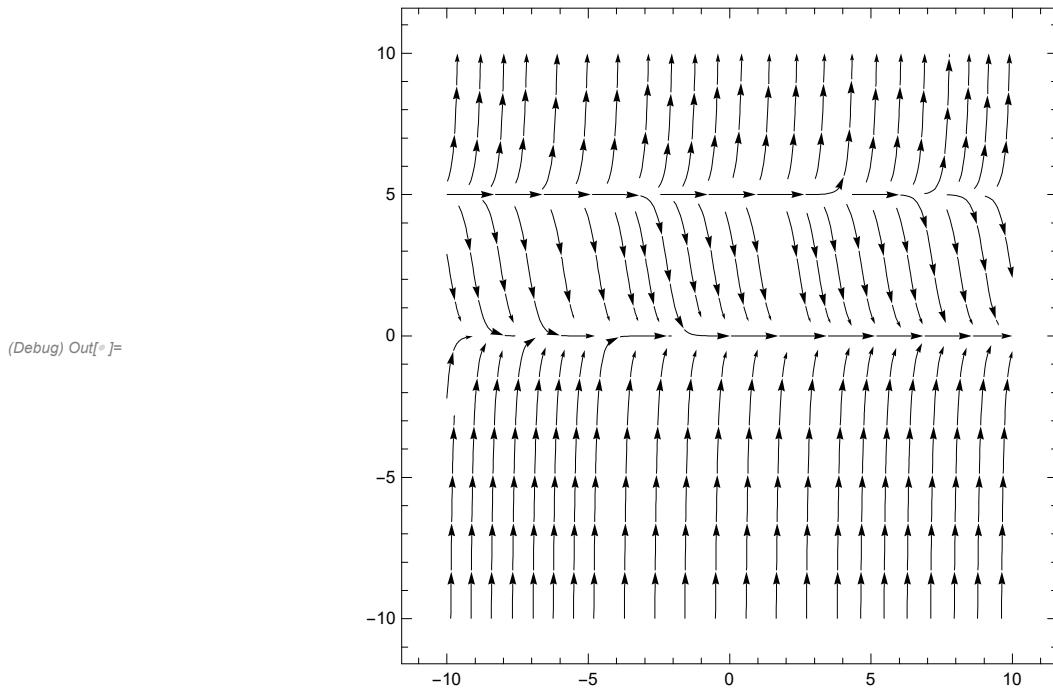
$$y' = -y(5-y)$$

(Debug) In[6]:= **solveDif12** = DSolve[y'[x] == -y[x] (5 - y[x]), y[x], x]

$$(Debug) Out[6]= \left\{ \left\{ y[x] \rightarrow \frac{5}{1 + e^{5x+5} C[1]} \right\} \right\}$$

(Debug) In[7]:= **field12[x\_, y\_]** := {1, -y (5 - y)}

(Debug) In[8]:= **stream12** = StreamPlot[field12[x, y], {x, -10, 10}, {y, -10, 10}, StreamStyle -> {Black}]



### Exercício 13

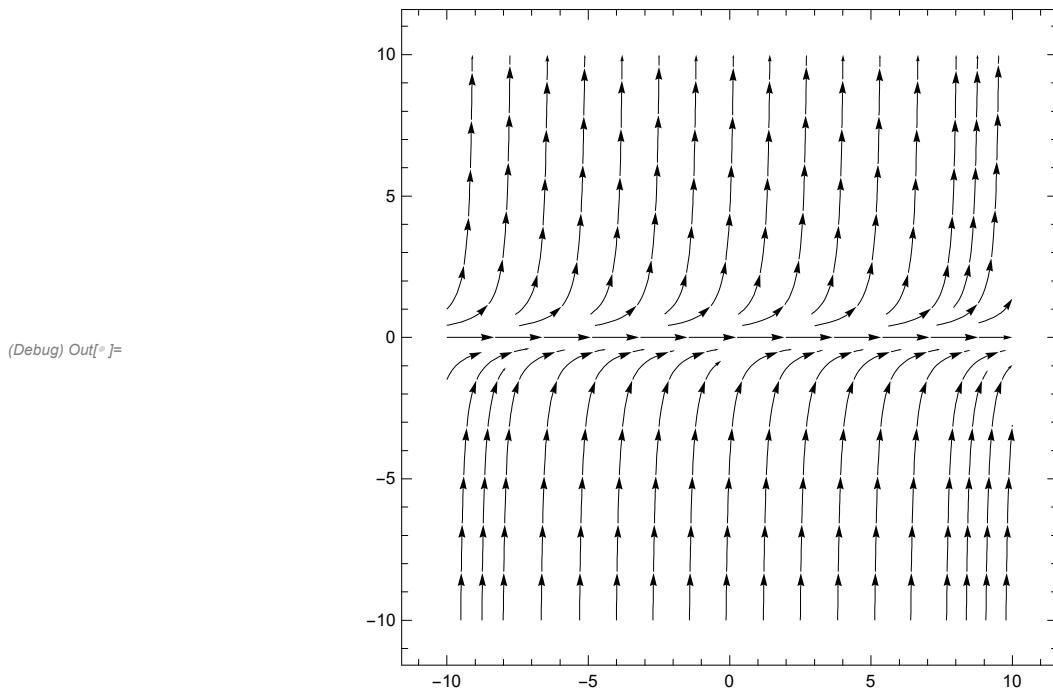
$$y' = y^2$$

(Debug) In[9]:= **solveDif13** = DSolve[y'[x] == y[x]^2, y[x], x]

$$(Debug) Out[9]= \left\{ \left\{ y[x] \rightarrow \frac{1}{-x - C[1]} \right\} \right\}$$

(Debug) In[10]:= **field13[x\_, y\_]** := {1, y^2}

(Debug) In[<sup>®</sup>] := **stream13** = StreamPlot[field13[x, y], {x, -10, 10}, {y, -10, 10}, StreamStyle → {Black}]



#### Exercício 14

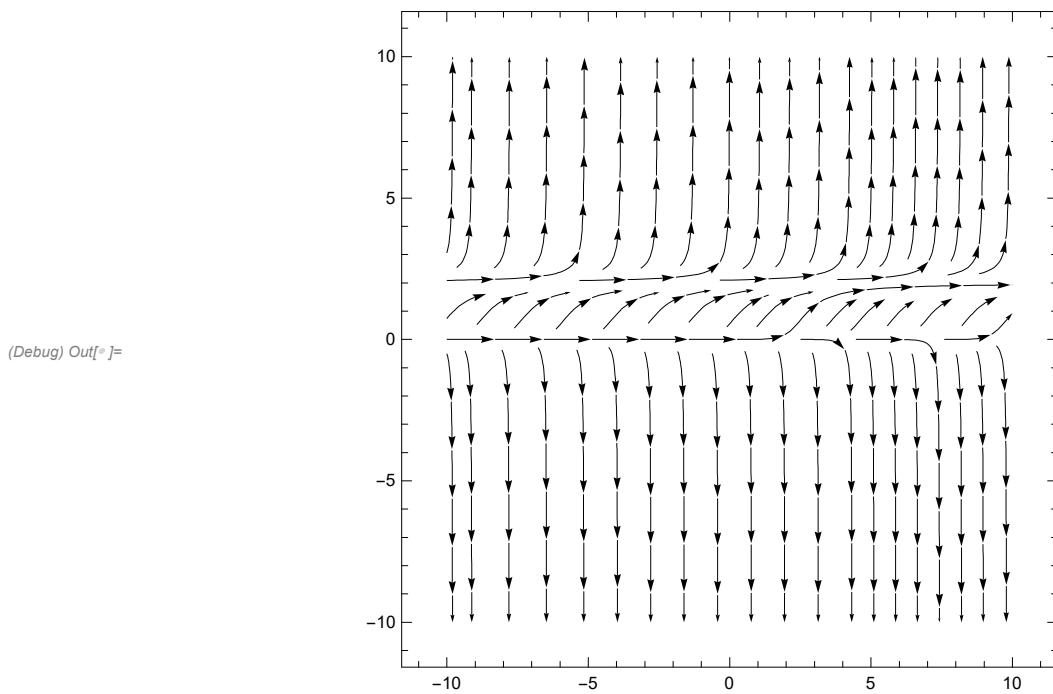
$$y' = y(y-2)^2$$

(Debug) In[<sup>®</sup>] := **solveDif14** = DSolve[y'[x] == y[x] (y[x] - 2)<sup>2</sup>, y[x], x]

$$(Debug) Out[<sup>®</sup>] = \left\{ \left\{ y[x] \rightarrow \text{InverseFunction} \left[ \frac{1}{4} \left( -\text{Log}[-2 + \#1] + \text{Log}[\#1] - \frac{2}{-2 + \#1} \right) \& \right] [x + C[1]] \right\} \right\}$$

(Debug) In[<sup>®</sup>] := **field14**[x\_, y\_] := {1, y (y - 2)<sup>2</sup>}

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

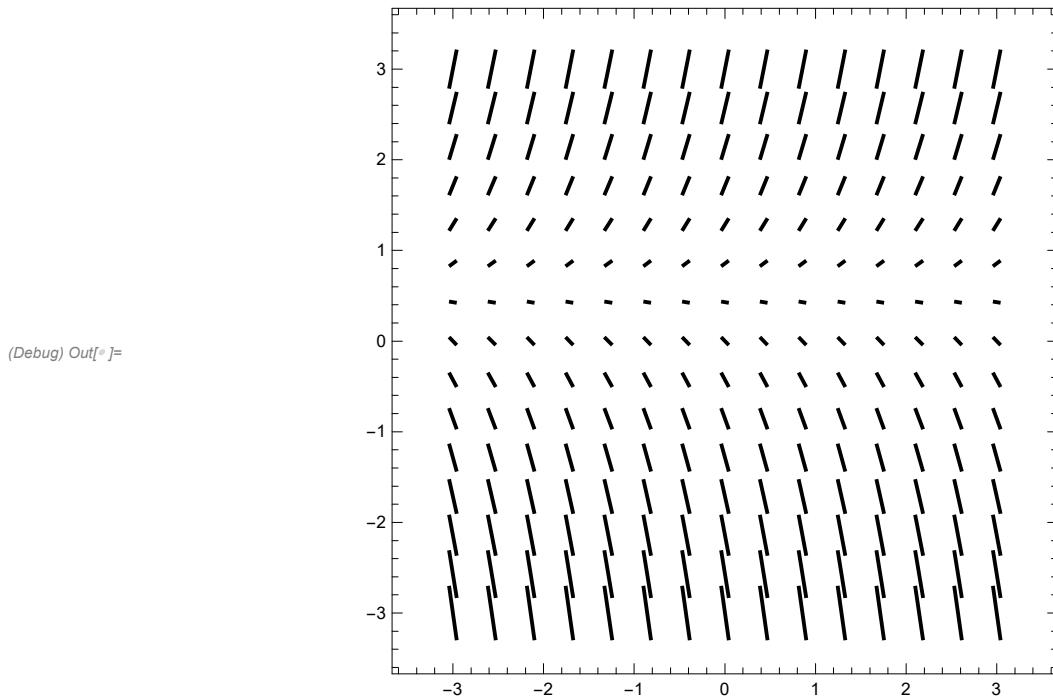


(Debug) Out[<sup>®</sup>] =

### Campos de direção para os exercícios do 15 ao 20

(a)

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

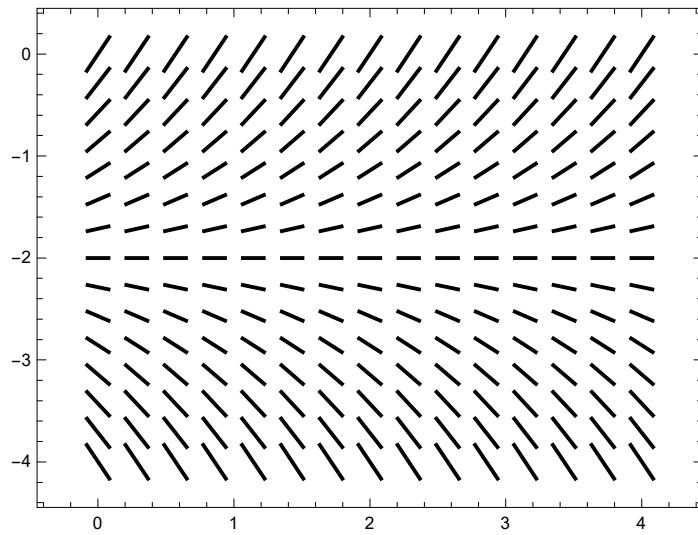


(Debug) Out[<sup>®</sup>] =

(Debug) In[<sup>®</sup>] :=

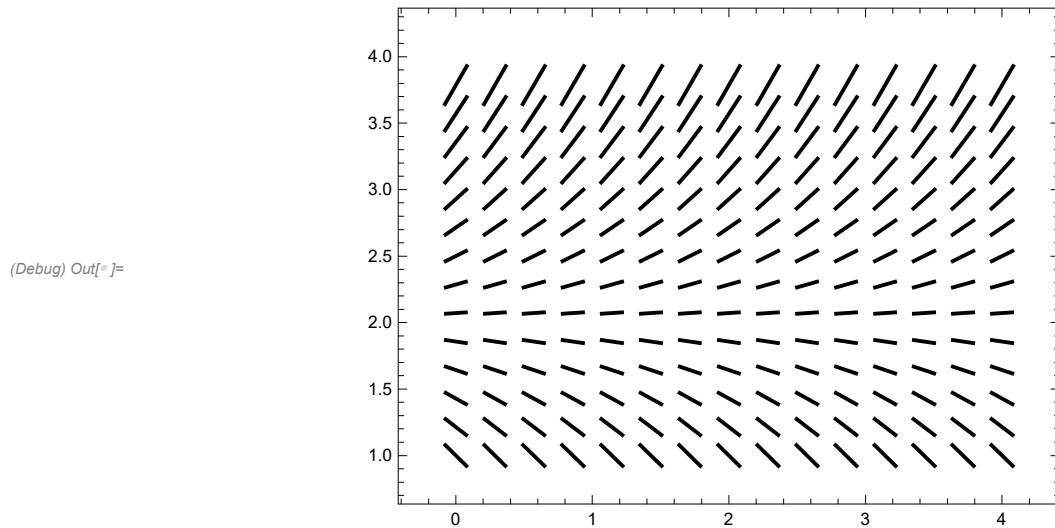
(b) FIG 1.1.8

```
(Debug) In[6]:= streamB = VectorPlot[{1, 2 + y}, {x, 0, 4}, {y, -4, 0},
  VectorStyle -> {Arrowheads[0], Black, Thick}, AspectRatio -> 3/4]
```



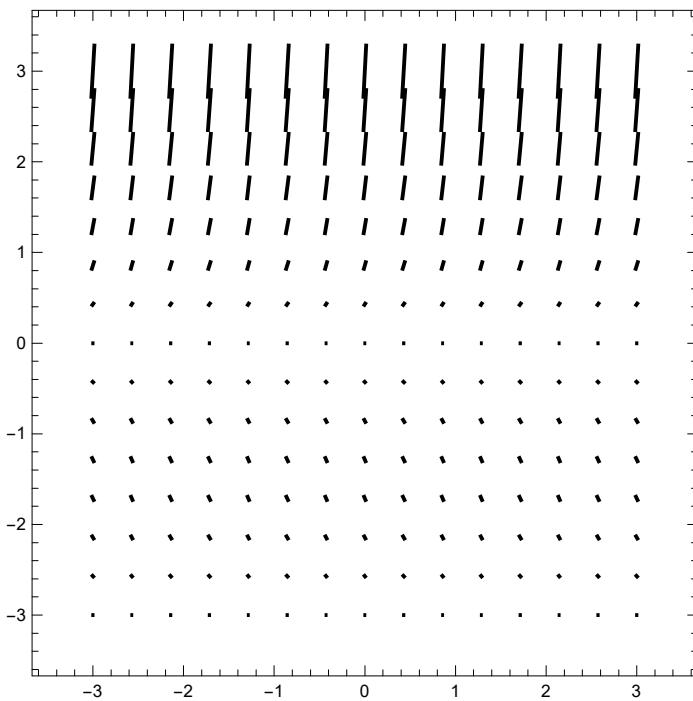
(c) FIG 1.1.6

```
(Debug) In[7]:= streamC = VectorPlot[{1, y - 2}, {x, 0, 4}, {y, 1, 4},
  VectorStyle -> {Arrowheads[0], Black, Thick}, AspectRatio -> 3/4]
```



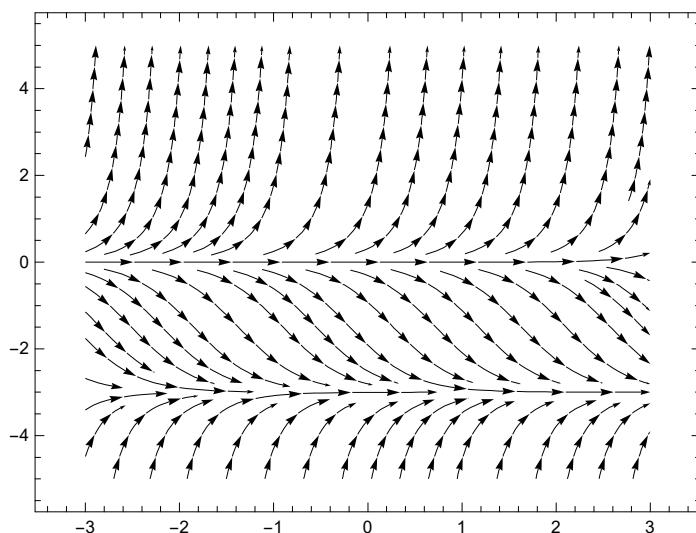
(d)

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



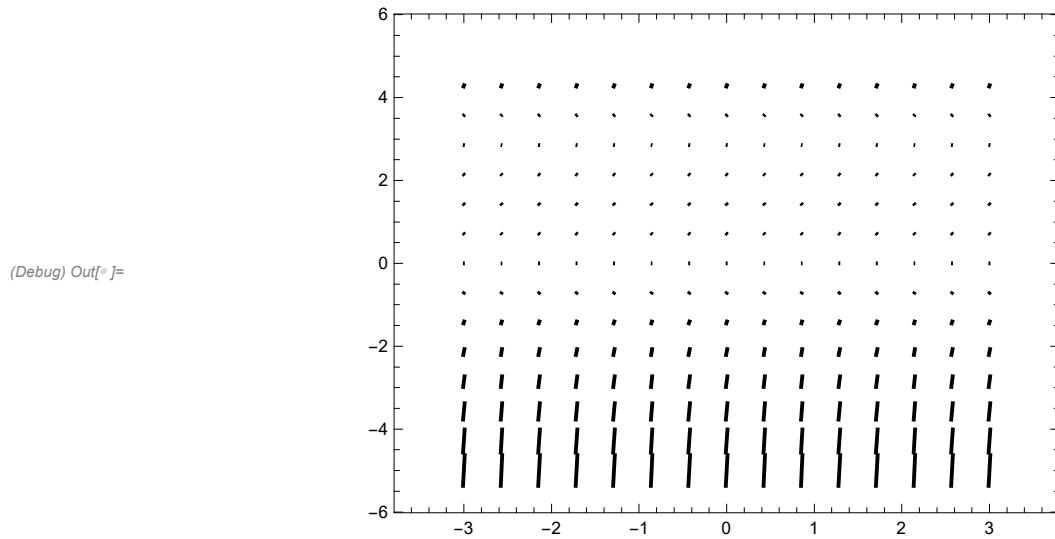
```
(Debug) Out[°]=
```

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

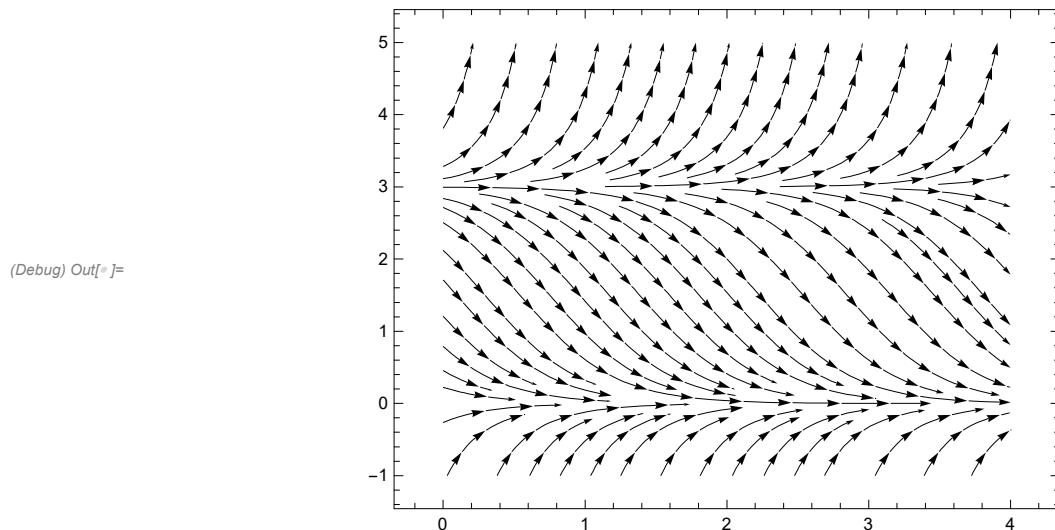


(e) FIG 1.1.10

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

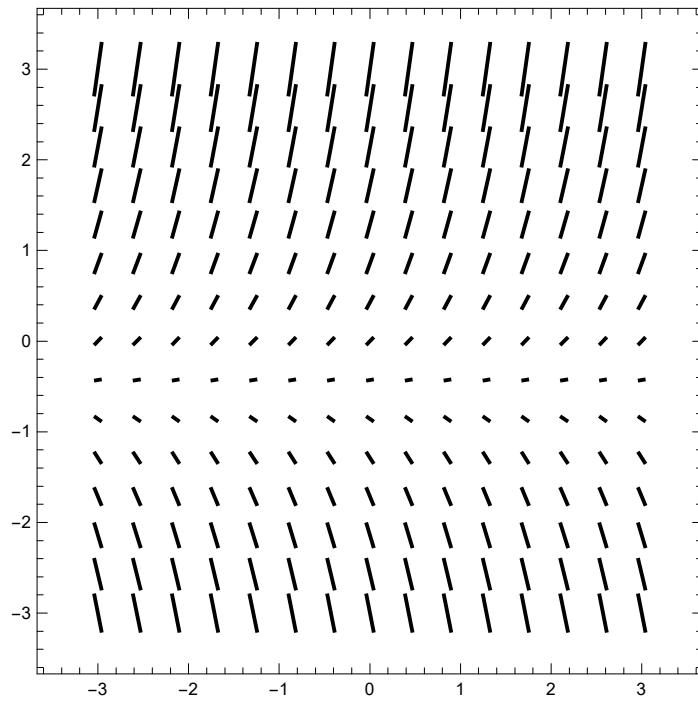


```
(Debug) In[°]:= streamE = StreamPlot[{1, y (y - 3)}, {x, 0, 4},
{y, -1, 5}, StreamStyle -> Black, AspectRatio -> 3 / 4]
```



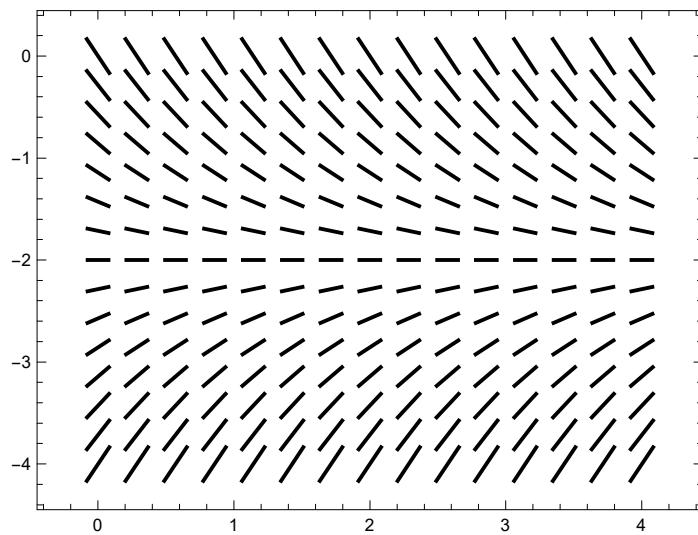
(f)

```
(Debug) In[6]:= streamF = VectorPlot[{1, 2 y + 1}, {x, -3, 3}, {y, -3, 3}, VectorStyle -> {Arrowheads[0], Black, Thick}]
```



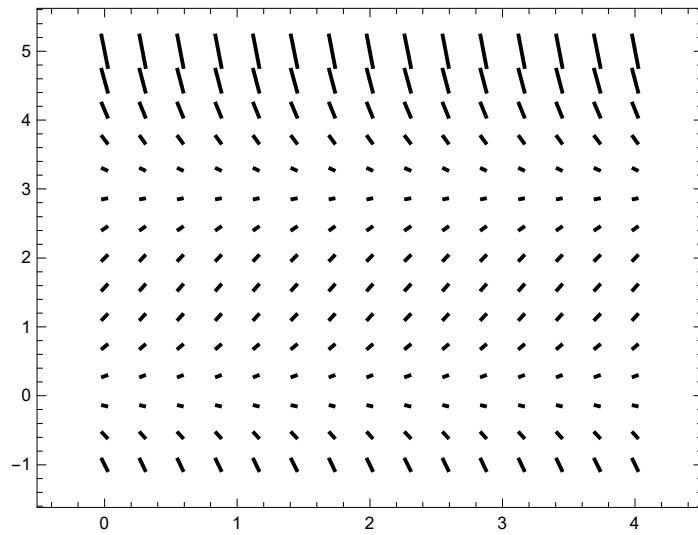
(g) FIG 1.1.7

```
(Debug) In[7]:= streamG = VectorPlot[{1, -2 - y}, {x, 0, 4}, {y, -4, 0}, VectorStyle -> {Arrowheads[0], Black, Thick}, AspectRatio -> 3/4]
```

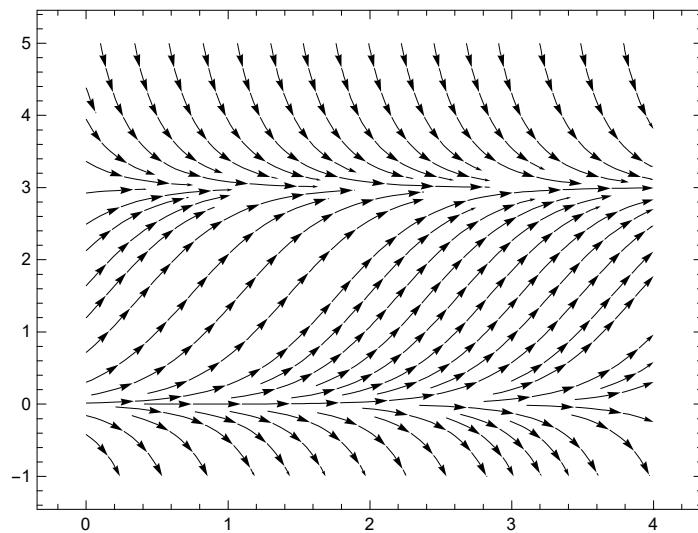


(h) FIG 1.1.9

```
(Debug) In[6]:= vectorH = VectorPlot[{1, y (3 - y)}, {x, 0, 4}, {y, -1, 5},
    VectorStyle -> {Arrowheads[0], Black, Thick}, AspectRatio -> 3/4]
```

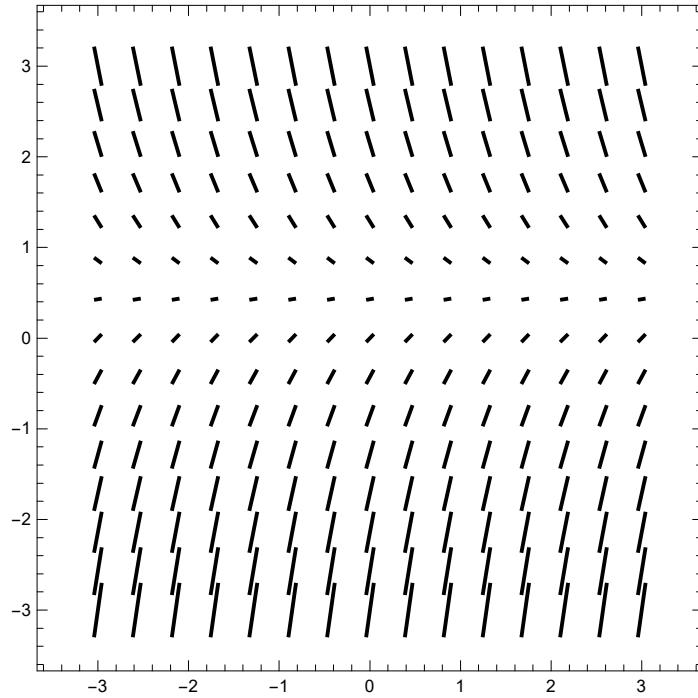


```
(Debug) In[6]:= streamH = StreamPlot[{1, y (3 - y)}, {x, 0, 4},
    {y, -1, 5}, AspectRatio -> 3/4, StreamStyle -> {Black}]
```



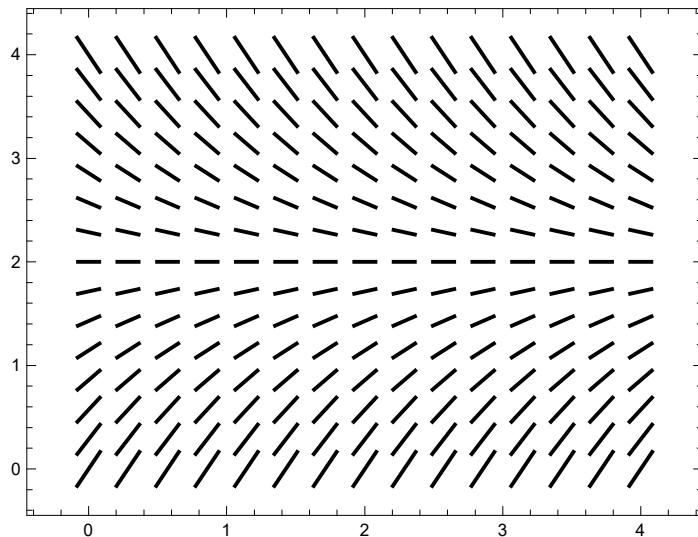
(i)

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



(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) In[°]:=
```