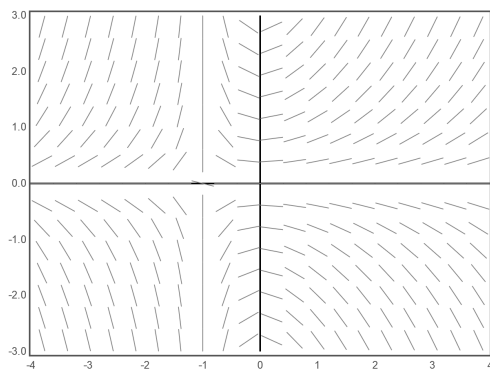


Math 5231 - Fall 2018
Problem Set 3

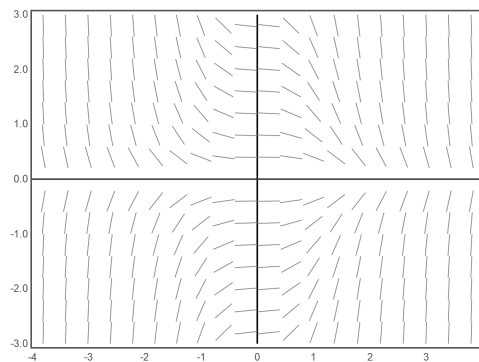
Solve the First Order Equations Find the general solution to the following differential equations

- 1) $t \frac{dy}{dt} = \frac{2yt^2}{t^2 + 1}$
- 2) $x \frac{dy}{dx} = x + y$
- 3) $t \frac{dy}{dt} - 2ty = t^2 - t$
- 4) $\frac{dR}{dx} = R - 1$

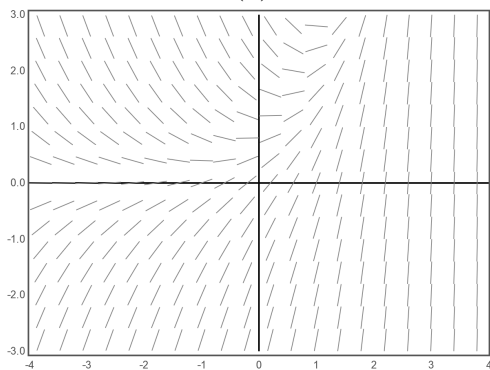
Match The Slop Plot Match the equations below to the slope plot. Identify the domain of the trajectories that are (1) asymptotically stable, asymptotically go to positive and negative infinity.



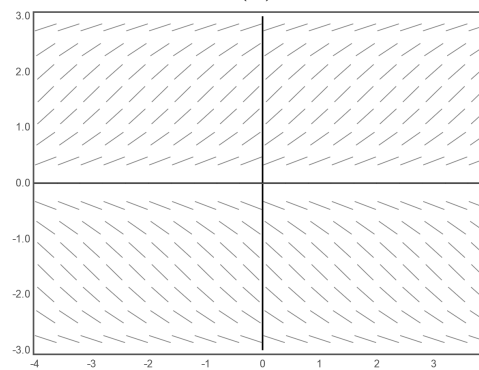
(a)



(b)



(c)



(d)

- 5) $y' = -x^2y$
- 6) $y' = e^x - y$
- 7) $y' = \frac{yx}{1+x}$
- 8) $y' = \sin(y)$

Draw The Slop Plot Draw the slop plot and the indicated trajectory for the following equations

9) $y' = y(y - 2), y(-2) = 1$
11) $y' = xy, y(0) = -1$

10) $y' = -y(y - 2), y(2) = 1$
12) $y' = x - y, y(-3) = 0$

Hint:

- a) Separation of variables
- b) Integrating factors
- c) Integrating factors
- d) Separation of variables

Answers:

1) $y = C(t^2 + 1)$

2) $y = x \log x + Cx$

3) $y = \frac{1}{4} - \frac{t}{2} + Ce^{2t}$

4) $R = Ce^t + 1$

5) (b)

6) (c)

7) (a)

8) (d)