Recitation #12: Direction fields and Separable Differential Equations

Warm up:

Which of the following differential equations are separable?

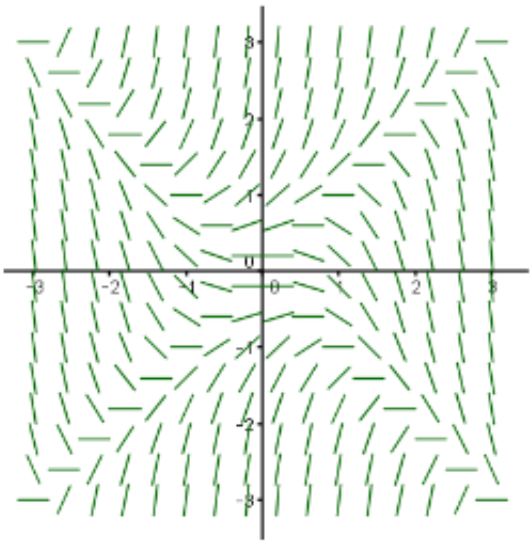
(a) $y' = \dfrac{ty}{t^2+1}$,

(b) $\dfrac{dy}{dx} = x^2 \sin(3y) - x^2$,

(c) $y' = t^2 - y$.

Group work:

Problem 1 *The following is a direction field for the differential equation* $\dfrac{dy}{dx} = y^2 - x^2$.

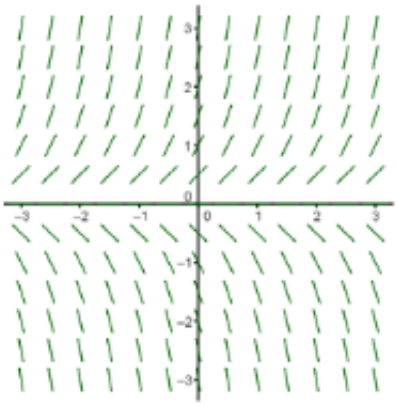


Sketch the solution such that $y\left(\dfrac{1}{2}\right) = 1$.

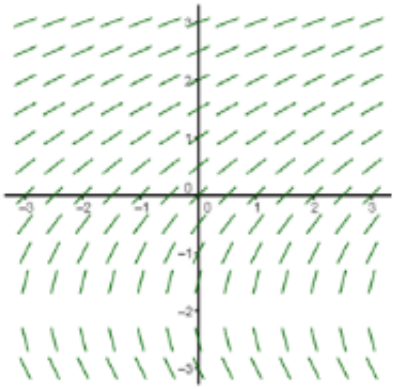
Problem 2 *Which of the following direction fields is the direction field corresponding to the differential equation* $y' = 1 + y^2$*?*

b.

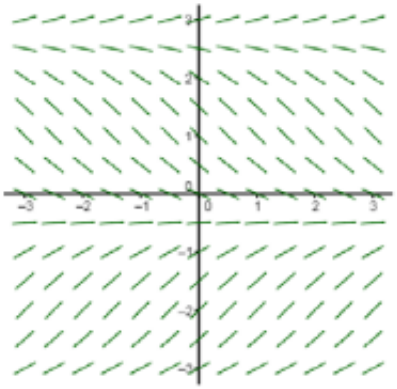
b.



c.



d.



Problem 3 *Find a specific solution to the differential equation* $\dfrac{dy}{dx} = x^{-2}\arctan(x)$ *if* $y(1) = 5$.

Problem 4 *Find a specific solution to the initial value problem*

$$\frac{dy}{dx} = x^2\sin(x), \qquad y(0) = 5.$$

Problem 5 *Solve the following differential equations assuming that* $y(4) = 5$.

(a) $y' = x + xy^2$

(b) $y' = e^{2x-y}$