

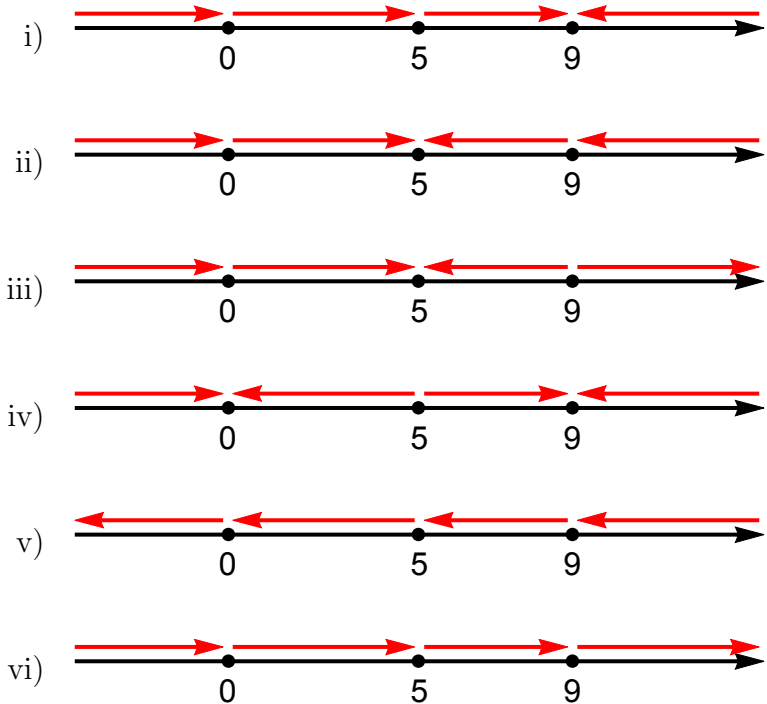
# Exam 1 Preview

Below are some sample questions that you should be able to answer from chapter 2; don't be surprised if several of these end up looking like exam questions.

1. The following questions are about the ODE

$$\frac{dy}{dx} = -3 \left(1 - \frac{y}{5}\right) \left(1 - \frac{y}{9}\right) y.$$

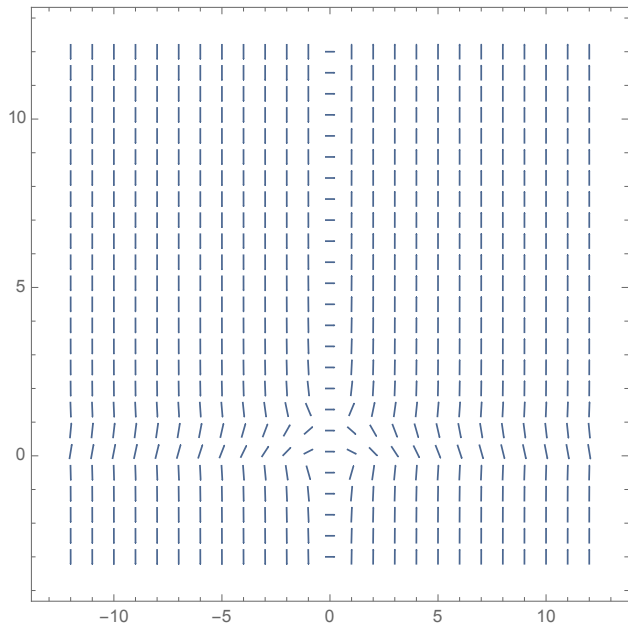
- (a) Find the equilibrium solutions of this ODE.
- (b) Classify each of the equilibrium solutions as asymptotically stable, asymptotically unstable, or neither. **Hint:** Do not assume that  $y > 0$ !
- (c) Assuming that  $y(0) = 2$ , find  $\lim_{x \rightarrow \infty} y(x)$ . **Do not solve the ODE!**
- (d) Which of the following phase lines correspond to this ODE?



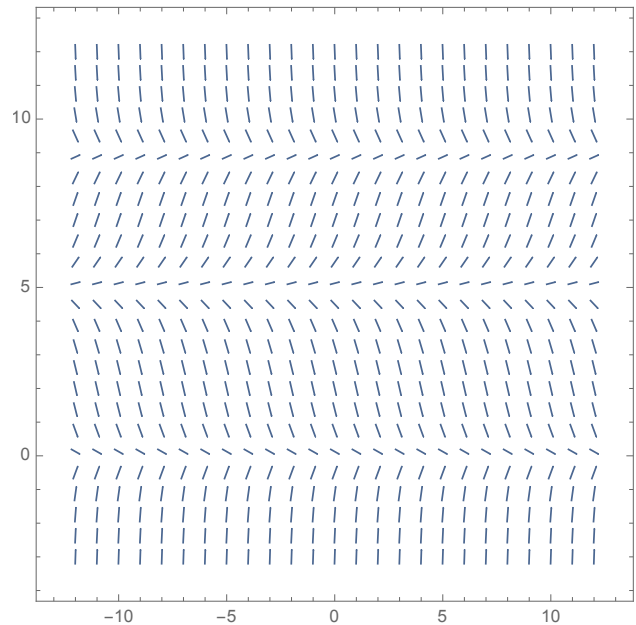
vii) None of the above

- (e) Sketch the solutions to this ODE using the qualitative methods discussed in class. **Do not solve the ODE!**
- (f) **True or False:** This ODE is linear.

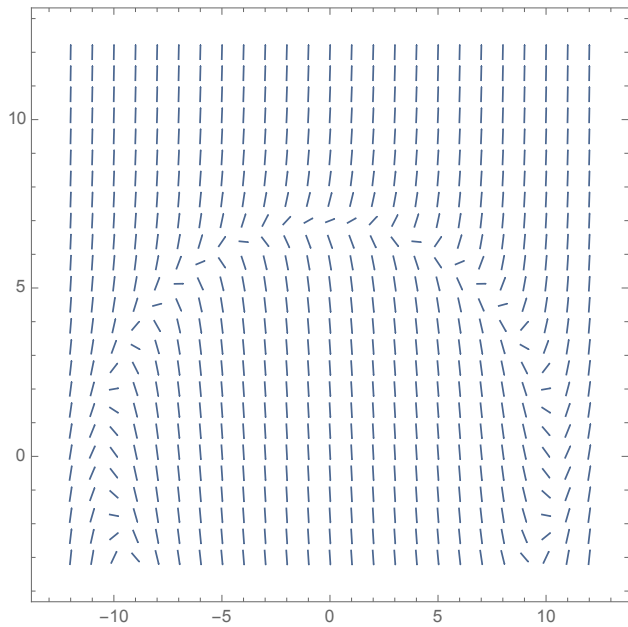
(g) Which of the following slope fields correspond to this ODE?



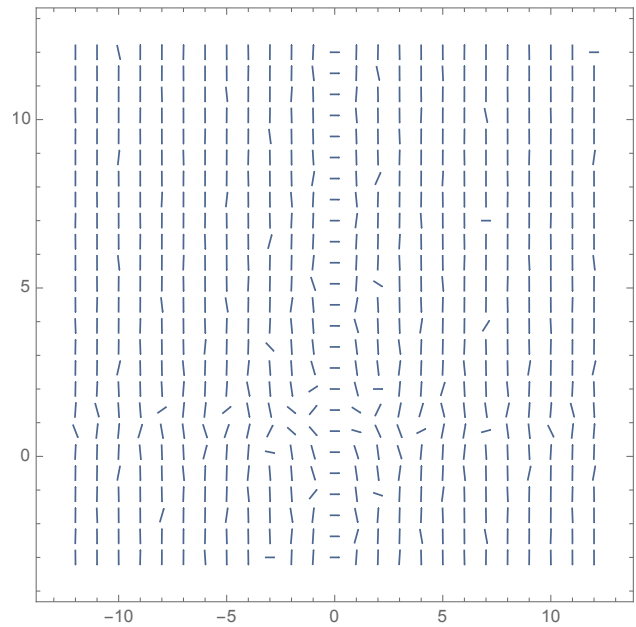
(i)



(ii)



(iii)



(iv)

(h) Find the general solution of this ODE. **Hint:** Expect to use partial fractions!

(i) Solve the IVP  $\frac{dy}{dx} = -3 \left(1 - \frac{y}{5}\right) \left(1 - \frac{y}{9}\right) y$ ,  $y(-1) = \pi$ .