Name: Solution

Math 221, Section 5

Quiz number 1

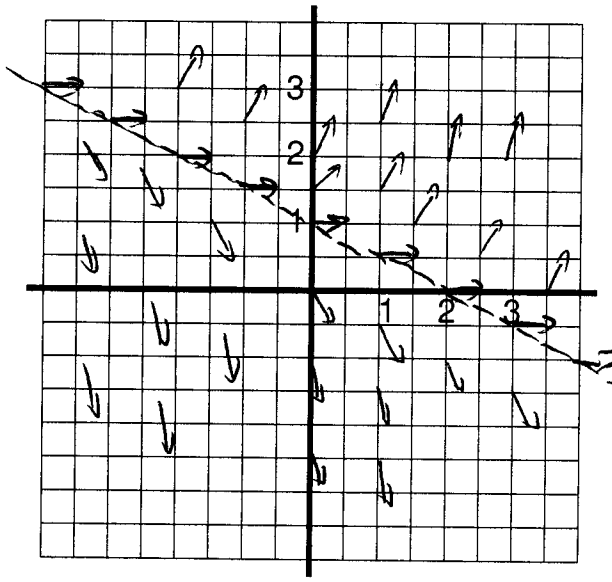
Show all work. How you get your answer is just as important, if not more important, than the answer itself. If you think it, write it!

1. Find the nullclines for the differential equation

$$\frac{dy}{dx} = x + 2y - 2 \quad = f(x,y)$$

(draw in the nullclines as dotted curves), and use this information to sketch the solutions to the DE which pass through the points

$$(0,1)\ (0,0)\ \text{, and } (0,-1)\ .$$



nullcline!

$f(x,y) = 0$

$x + 2y - 2 = 0$

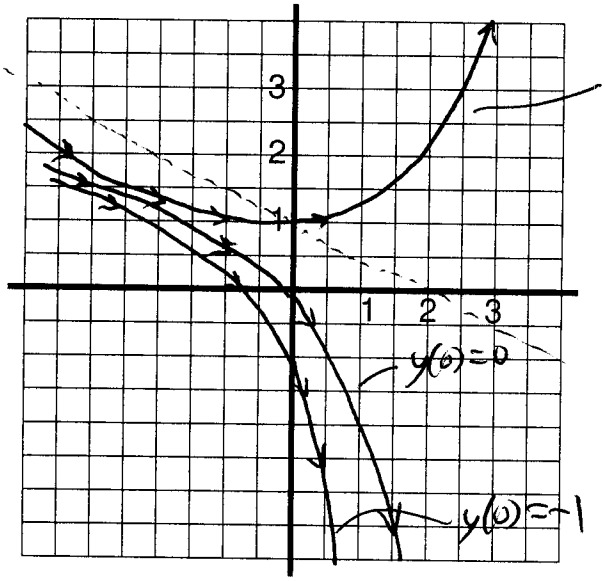
$2y = 2 - x$

$y = -\frac{1}{2}x + 1$

nullcline

$\frac{dy}{dx} = -2$ at $(0,0)$

& negative below line, positive above



solutions climb faster as they rise higher above the nullcline, and fall faster as they fall lower below the nullcline

N.B.: $y = -\frac{1}{2}x + \frac{3}{4}$ is a solution to the D.E.! This solution separates the "eventually goes up" solutions from the "eventually goes down" ones.