HW for Ch. 8

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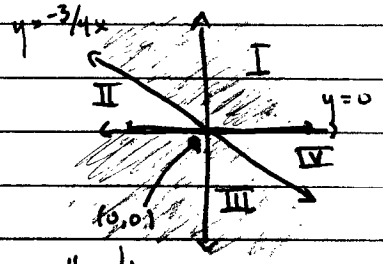
1. $dx/dt = 3x + 4y \Rightarrow$ null cline: $y = -3/4\,x$

$dy/dt = y \Rightarrow$ null cline: $y = 0$



equilibrium point: $(0,0)$ intersection of the two null clines

2. I: choose pt. $(1,1)$, then $dx/dt > 0$ $dy/dt > 0$

II choose pt. $(-4,2)$, then $dx/dt < 0$ $dy/dt > 0$

III choose pt. $(-1,-1)$, then $dx/dt < 0$ $dy/dt < 0$

IV choose pt. $(4,-2)$, then $dx/dt > 0$ $dy/dt < 0$

6. A trajectory starting at $(1,1)$ will have an initial slope $(7,1)$. It will continue moving up and to the right, not leaving the region, without bound. As $t \to \infty$, so will x and y.

7. $\begin{matrix} dx/dt = 3x + 4y \\ dy/dt = y \end{matrix} \Rightarrow A = \begin{pmatrix} 3 & 4 \\ 0 & 1 \end{pmatrix} \Rightarrow \det A = 3 \cdot 1 - 4 \cdot 0 = 3 > 0$ ✓

$\operatorname{tr}(A) = 3 + 1 = 4 > 0$ ✗

Since $\operatorname{tr}(A) > 0$, the equilibrium pt. $(0,0)$ is not stable