

Math 211, Answer to Quiz 3 (2/13/08)

(1) Consider the equation

$$\frac{dy}{dt} = y^2 + 3y - \mu$$

where μ is a parameter.

(a) (3 pts) When $\mu = 1$, calculate the equilibrium solution and sketch the phase line.

Answer: When $\mu = 1$, the equilibrium solution satisfies $y^2 + 3y - 1 = 0$, which leads to $y = (-3 \pm \sqrt{13})/2$. Mark both points in the phase line.

It can be readily checked that for $y < (-3 - \sqrt{13})/2$, we have $y^2 + 3y - 1 > 0$ so that the arrow (increasing t) direction points up in the phase line. Similarly, for $(-3 - \sqrt{13})/2 < y < (-3 + \sqrt{13})/2$, the arrow points down. For $y > (-3 + \sqrt{13})/2$, the arrow points up.