Quiz #1 - 10 Points
5 September 2008

NAME: Solutions

1. (6 points). Find the most general solution to

$$y' - 3y = 5.$$

Separate Variables: $\dfrac{dy}{3y+5} = dt$

Integrate: $u = 3y+5$

$du = 3\,dy$

$$\frac{1}{3}\int \frac{du}{u} = \frac{1}{3}\ln|3y+5| = t + C$$

$$3y+5 = Ce^{3t}$$

$$\boxed{y = -5/3 + Ce^{3t}}$$

Check: $y' = 3Ce^{3t}$

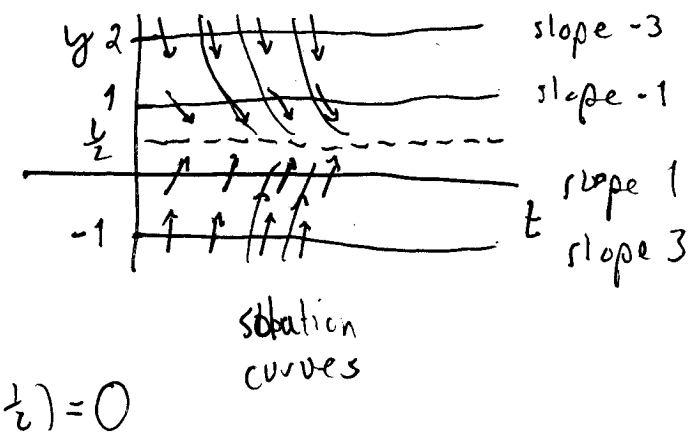
$y' - 3y = 3Ce^{3t} - 3Ce^{3t} + 5$

$= 5$ ✓

2. (4 points). Clearly identify the direction field of the ODE: $y' + 2y = 1$. Sketch the direction field. What is $\lim_{t\to+\infty} y(t)$?

ODE: $y' = 1 - 2y$

Direction field: $f(t,y) = 1 - 2y$ independent of t



$f(t, \frac{1}{2}) = 0$

$y \to \frac{1}{2}$ $f(t,y) < 0$

$\lim_{t\to+\infty} y(t) = \frac{1}{2}$ equilibrium soln.