1.2 # 1b

$$\frac{dt}{-2y+5}\left(\frac{dy}{dt}\right) = \frac{(-2y+5)}{-2y+5}\,dt \qquad y(0) = y_0$$

solve by separating variables

$$\int \frac{dy}{-2y+5} = \int dt$$

$$-2\left[\left(\frac{-1}{2}\right)\ln|-2y+5|\right] = [t+C](-2)$$

$$\ln|-2y+5| = -2t + C$$

$$e^{\ln|-2y+5|} = e^{-2t+C}$$

$$|-2y+5| = e^{-2t}e^{C}$$

$$-2y+5 = \pm e^{C}e^{-2t} = Ce^{-2t}$$

$$\frac{-2y}{-2} = \frac{Ce^{-2t}}{-2} - \frac{5}{-2}$$

$$y = Ce^{2t} + 5/2$$

Solve IVP

$y = Ce^{-2t} + \frac{5}{2}$ soln to DE

soln to IVP: $y_0 = Ce^0 + \frac{5}{2} \Rightarrow C = y_0 - \frac{5}{2}$

$y(0) = y_0$

IVP soln: $y = \left(y_0 - \frac{5}{2}\right)e^{-2t} + \frac{5}{2}$

Graph:

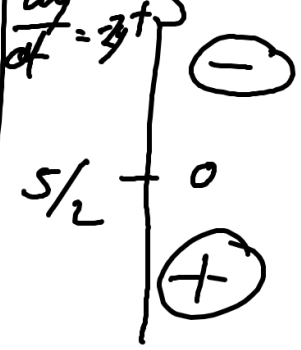
slope field

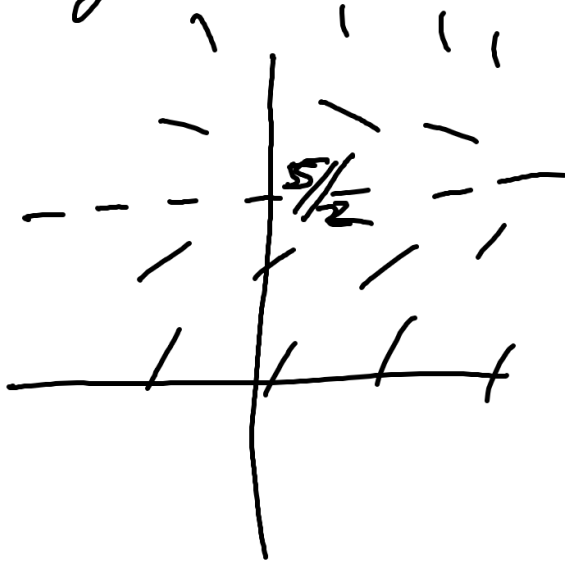
$\boxed{\frac{dy}{dt} = -2y + 5}$

Equil soln $y = K \hookrightarrow y' = 0$

slope 0

$0 = -2y + 5 \Rightarrow y = 5/2$





1.2 13a $\frac{dQ}{dt} = aQ + b$ $\frac{-1}{RC} = a < 0$

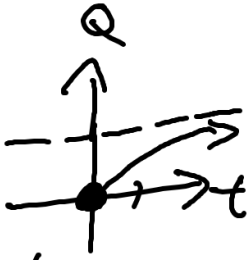
$$\text{KVL}\left[R\frac{dQ}{dt} + \frac{Q}{C} = V\right] \Rightarrow RC\,dQ + Q\,dt = VC\,dt$$

variables are Q and t

R, C, V are constants

13a) Solve for $Q(t)$ where

$$\frac{RC\,dQ}{VC - Q} = \frac{VC\,dt - Q\,dt}{} = \frac{(VC - Q)\,dt}{VC - Q}$$

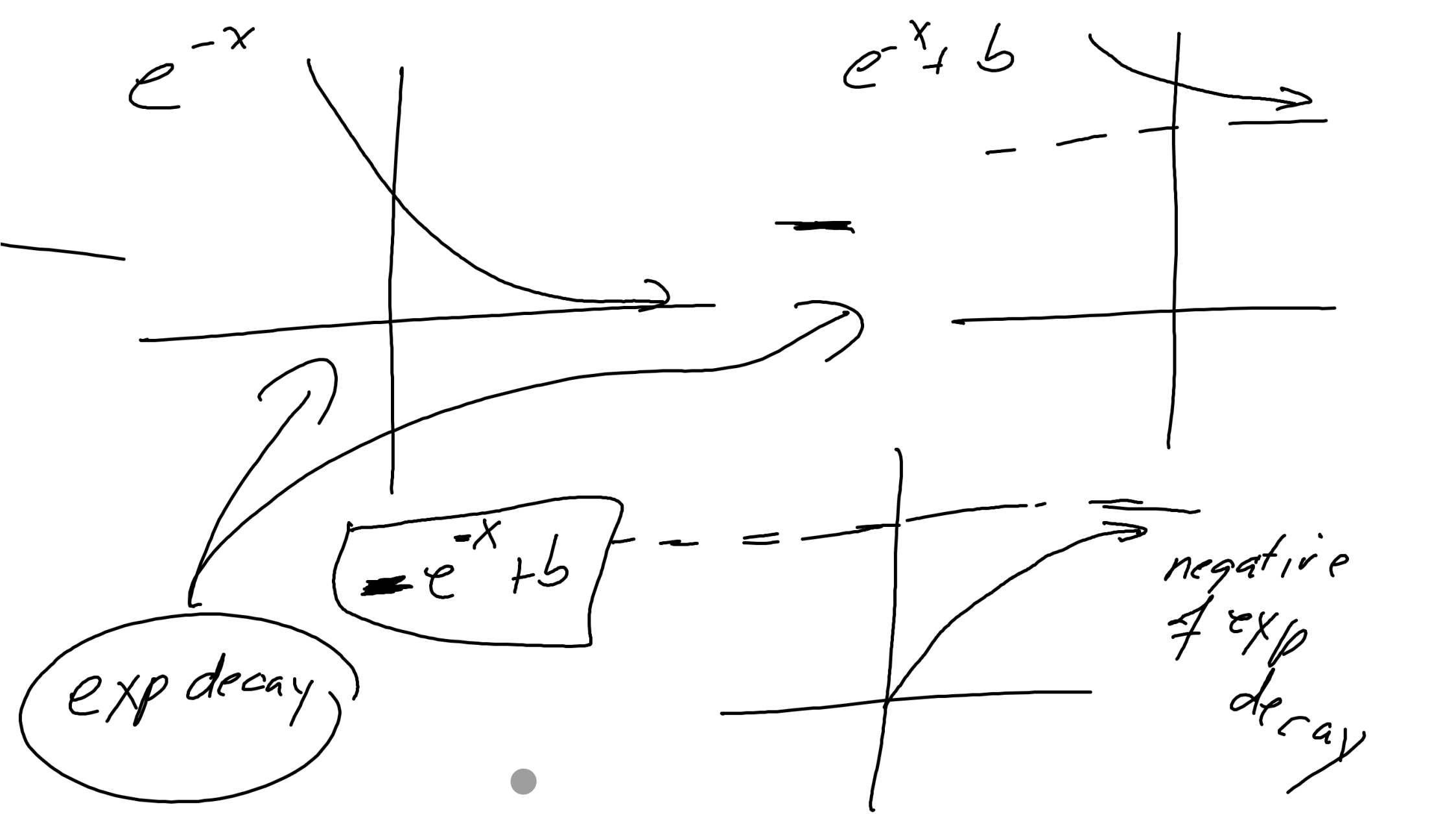


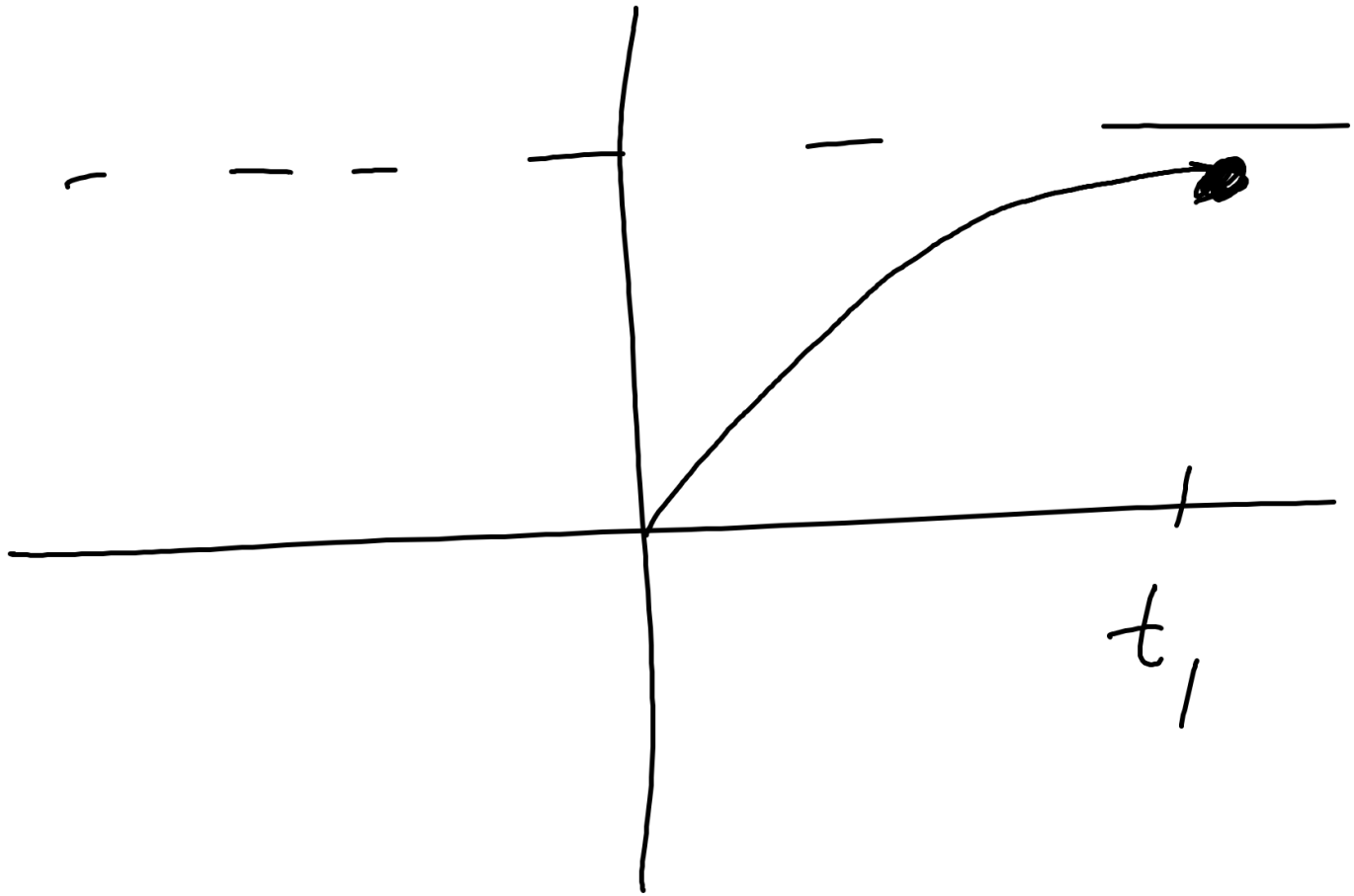
etc

solve plug in initial value $Q(0) = 0$ to find constant k_2

13c remove battery

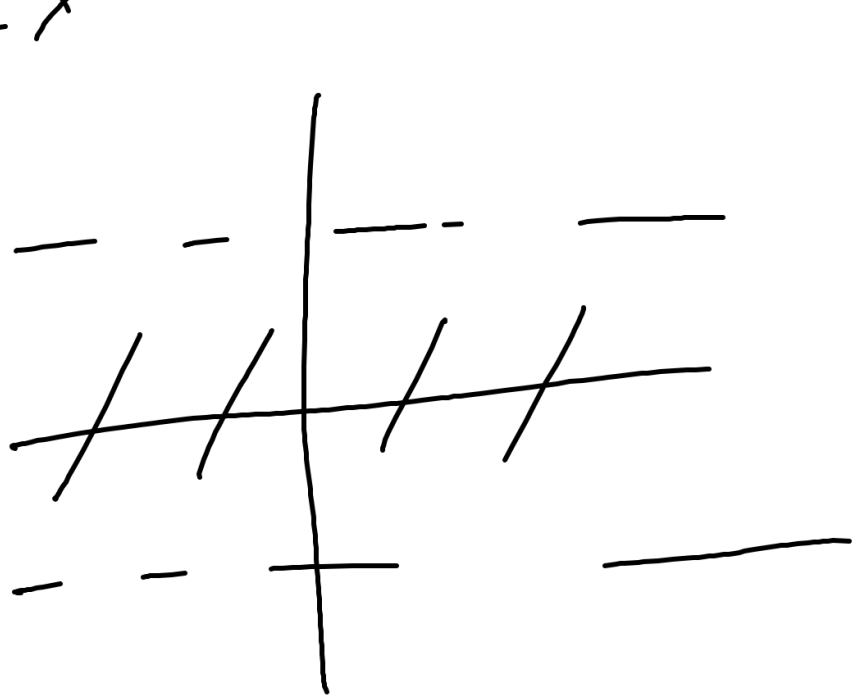
$V = 0$

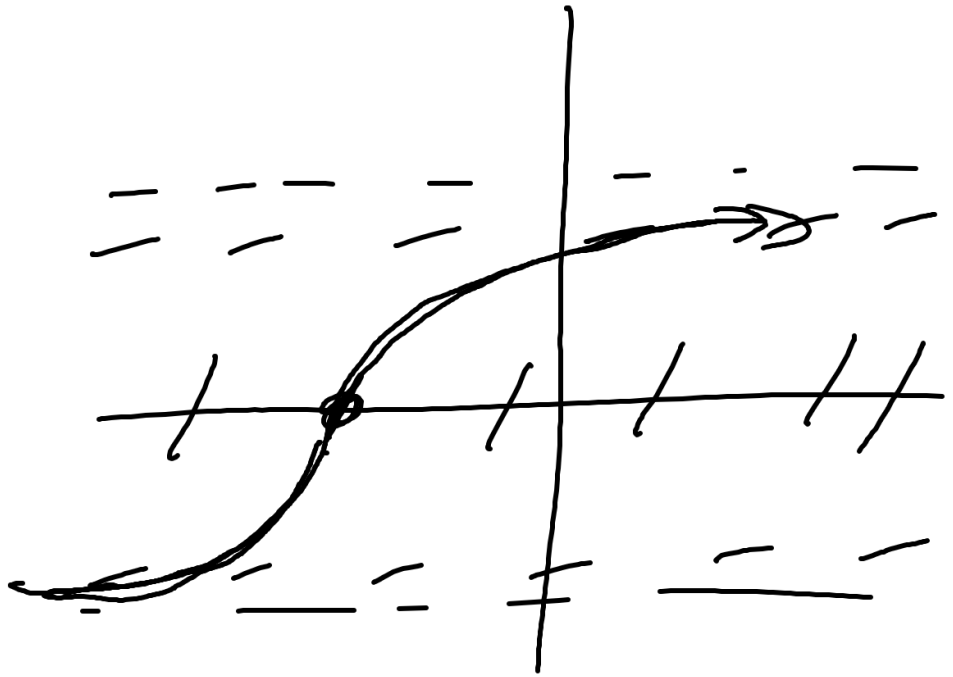

e^{-x}
$e^{-x} + b$
$-e^{-x} + b$
exp decay
negative of exp decay


t_1

1.1 slope fields: Draw enough slopes so that sol'ns are "obvious"

ex






2 different slopes
3 different slope + multiple copies