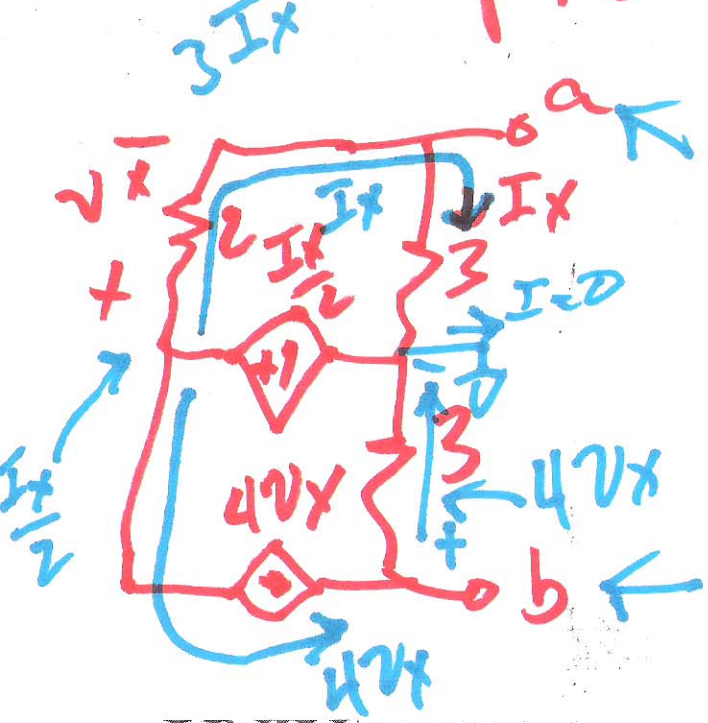
EE 220

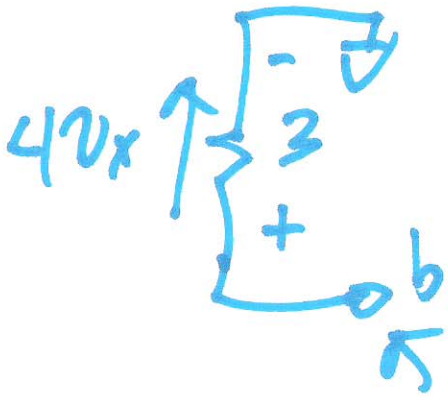
6/30/14

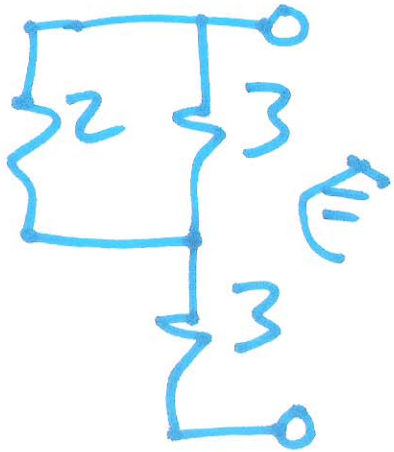
Lecture 15

Problem 39

Focus!







$$V_x = \frac{I_x}{2} - 3I_x = \frac{-5I_x}{2}$$

$$\frac{-5I_x}{2} = I_x$$

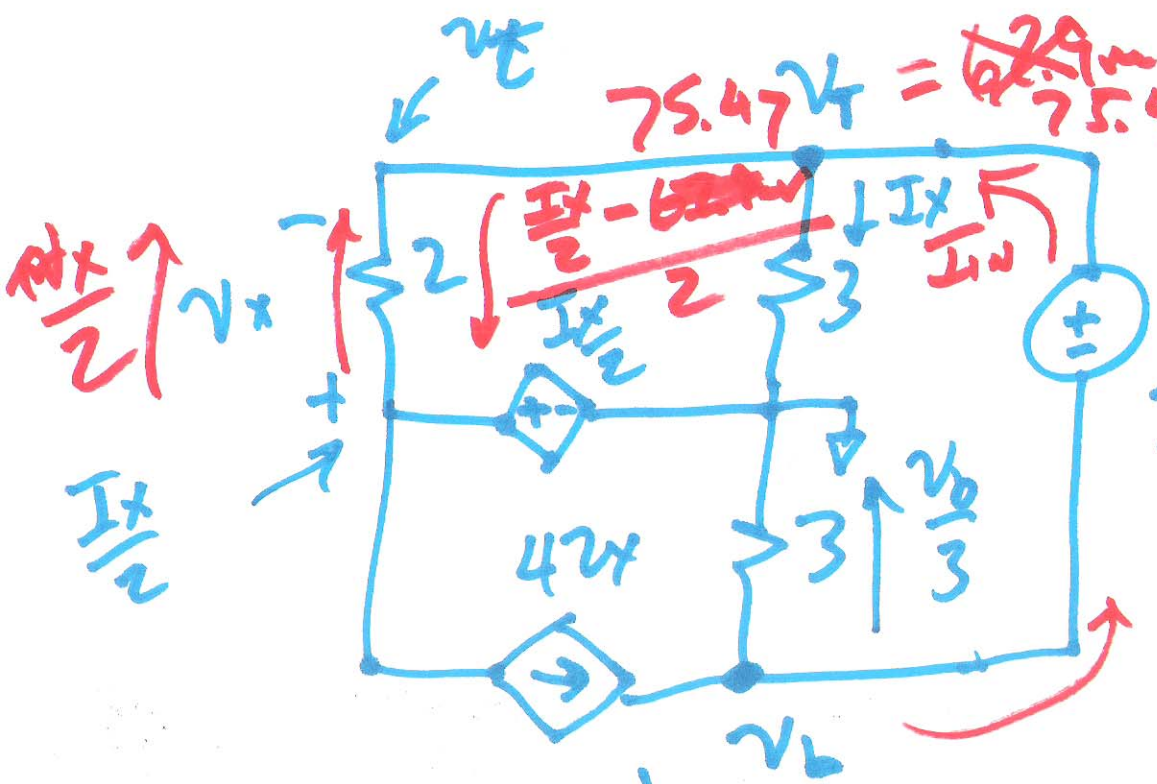
$$3 + 2 \| 3 = R_{eq} = 4.2$$

$$\frac{2}{2}$$

$I_x = 0$

$V_x = 0$

12Vx



$V_T - V_b = 1, \quad V_T = 1 + V_b$

$V_T = 3 \cdot I_x$

$\frac{V_x}{2} + 4V_x = \frac{V_b}{3} + I_x$

$\frac{I_x}{2} - V_T = V_x$

$4.5V_x = I_x - \frac{1}{3} + I_x$

$\frac{I_x}{2} - 1 - 3I_x + 1 = V_x$

$4.5V_x = 2I_x - \frac{1}{3}$

$13.5V_x = 6I_x - 1$

$1 + V_b = 3I_x, \quad V_b = 3I_x - 1$

$V_x 4.5 = \frac{V_b}{3} + I_x$

$\frac{I_x}{2} - 1 - V_b = V_x$

$13.5 V_x = 6 I_x - 1$

$-5 I_x = 2 V_x$, $V_x = -2.5 I_x$

$13.5 \cdot (-2.5) \cdot I_x = 6 I_x - 1$

$6 I_x + 33.75 I_x = 1$

$39.75 I_x = 1$

$I_x = 25.16 mA$

$\frac{\frac{.02516}{2} - .07547}{2}$

$= -31.44 mA$

$I_{in} = 25.16 mA$

$+ 31.44 mA$

$56.60 mA$

$V_T = 75.47 mV$

$V_x = 62.9 mV$

$\frac{1V}{.0566} = 17.66 \Omega$

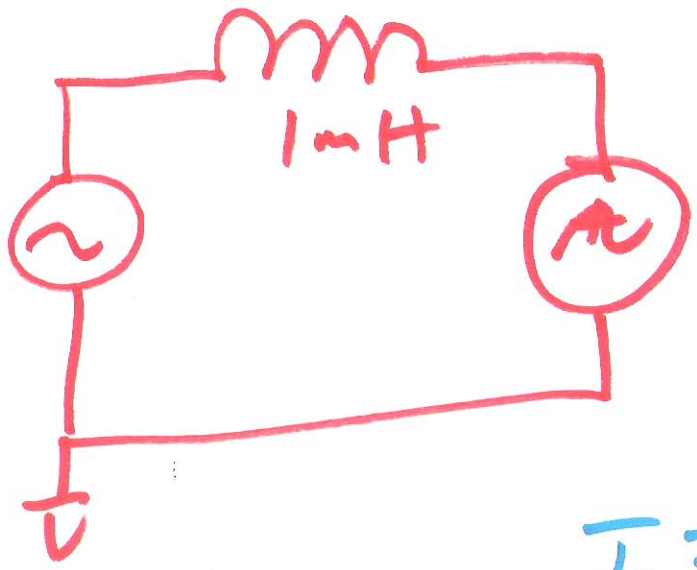
3)

Quiz

$\theta = \frac{t_d}{T} \cdot 360, \quad t_d = \frac{131}{360} \cdot 2\mu s = 736ns$

$1.2\angle 0°$

$0.8\angle 45°$



$\sin(\quad)$

$\sin(0 \quad 0.8 \quad 500k \quad -2.5\mu)$

$0 \quad 112$

$500k$

$T = 2\mu s$

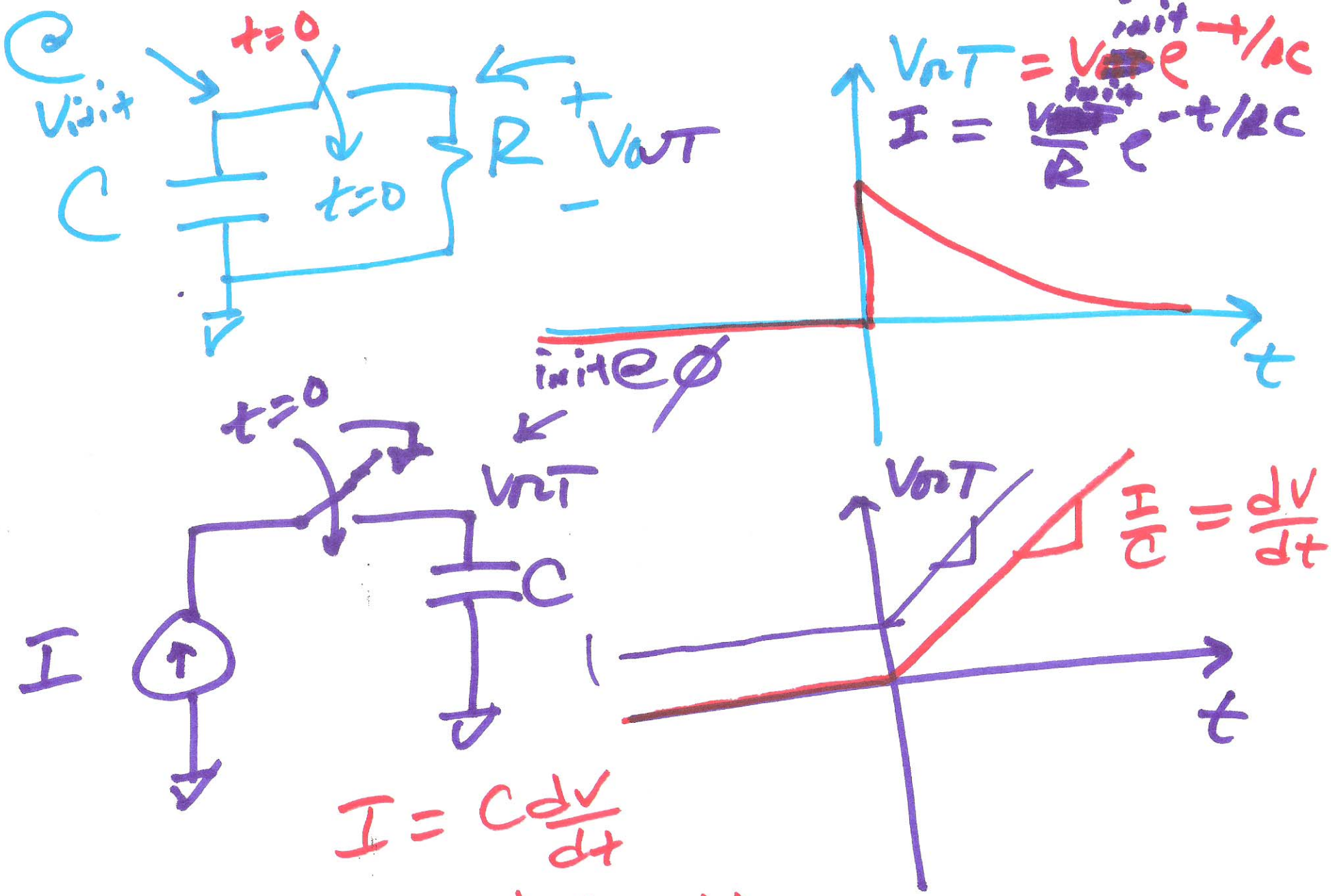
$$I = \frac{1.2\angle 0 - 0.8\angle 45}{0 + j \cdot 2\pi \cdot 500k \cdot 10^{-3}}$$

$$= \frac{1.2 + j0 - .566 - j.566}{0 + j3140}$$

$$= \frac{.634 - j.566}{0 + j3140}$$

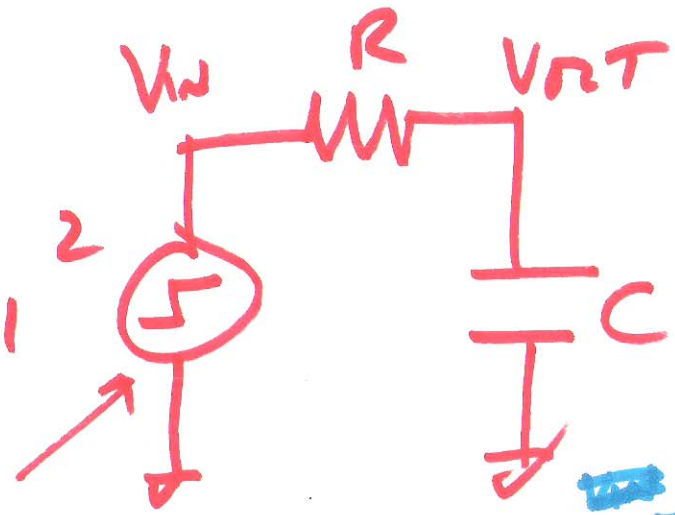
$$2714A = \frac{.85\angle -41.75°}{3140\angle 90°}$$

$\angle -131.75°$

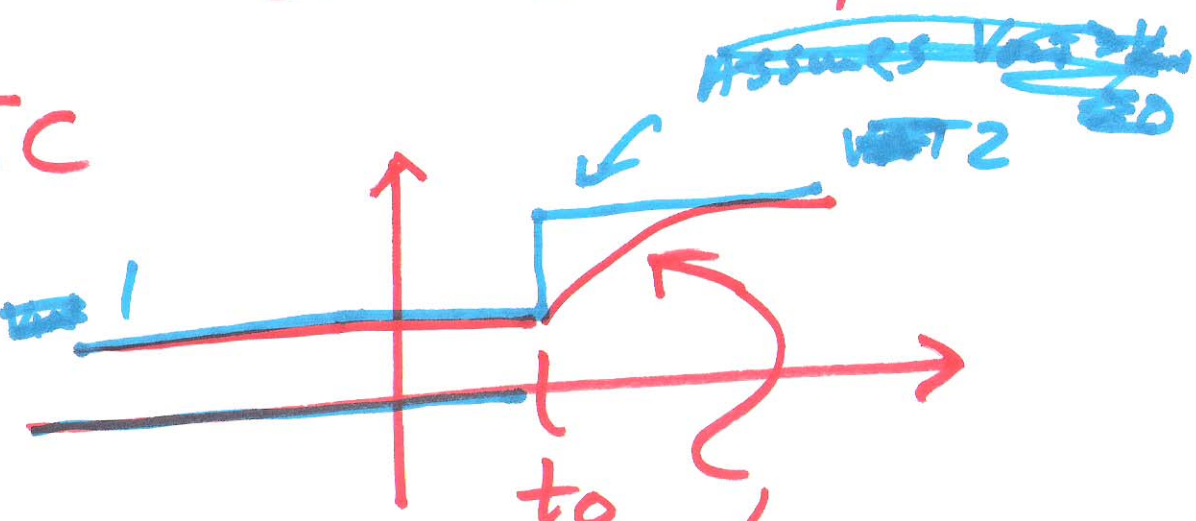


$$I = C\frac{dV}{dt}$$

$$V = \frac{1}{C}\int I \cdot dt$$



Sketch V_{IN} & V_{OUT}

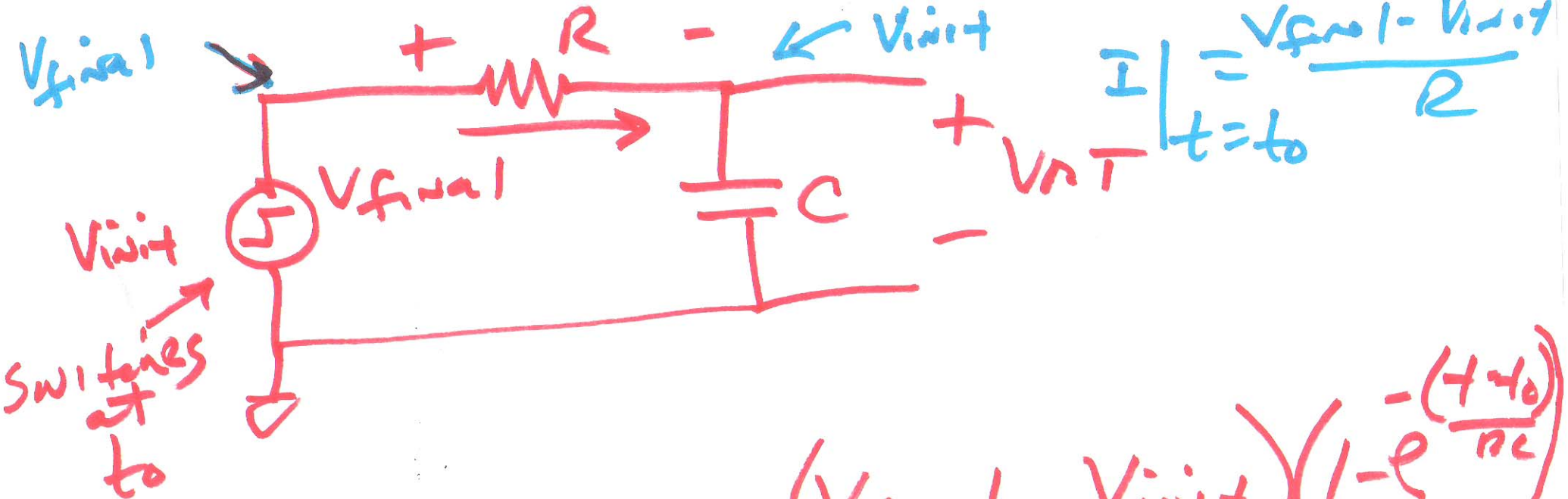


t_0
sw. toggles
from 1 → 2

$t > t_0$

$$V_{OUT}(t) = V_{init} + (V_{final} - V_{in,+})(e^{-(t-t_0)/RC} + 1)$$

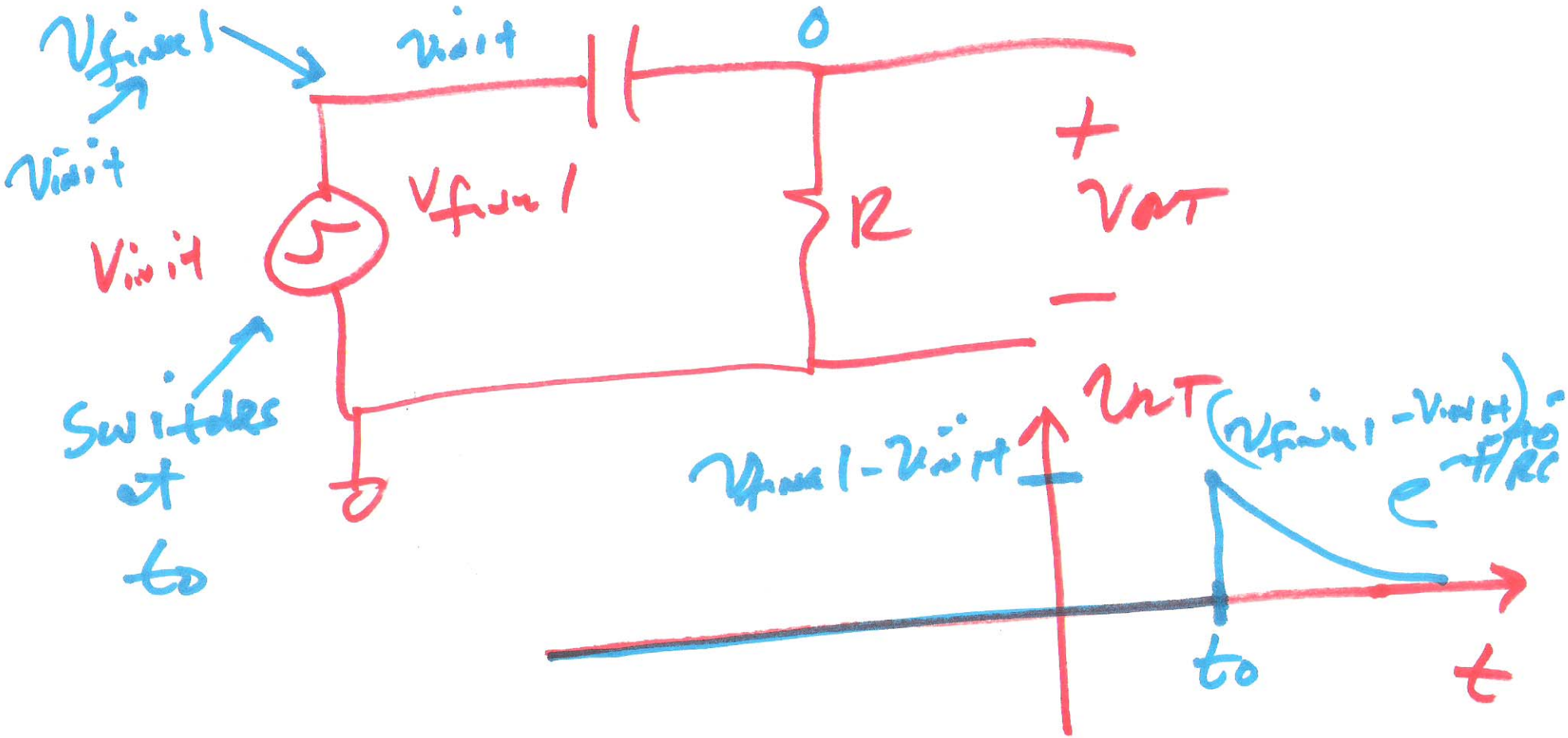
$$V_{OUT}(t) = V_{init} + (V_{final} - V_{in,+})(e^{-(t-t_0)/RC} + 1)$$



$$I\Big|_{t=t_0} = \frac{V_{final} - V_{init}}{R}$$

$$V_{OUT}\Big|_{t>t_0} = V_{init} + (V_{final} - V_{init})\left(1 - e^{-\frac{(t-t_0)}{RC}}\right)$$

$$I\Big|_{t>t_0} = \frac{V_{final} - V_{OUT}}{R}$$



$$V_{final} - (v_{OUT}) = v_{init}$$

$$v_{OUT} = V_{final} - v_{initial}$$