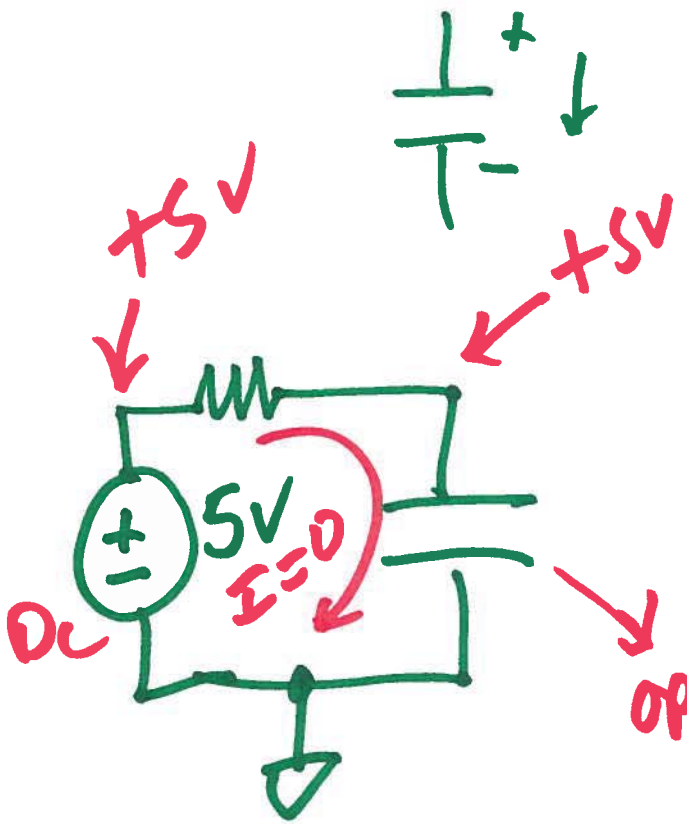
EE 220

Circuits I

Lecture 15



$$CV = Q$$

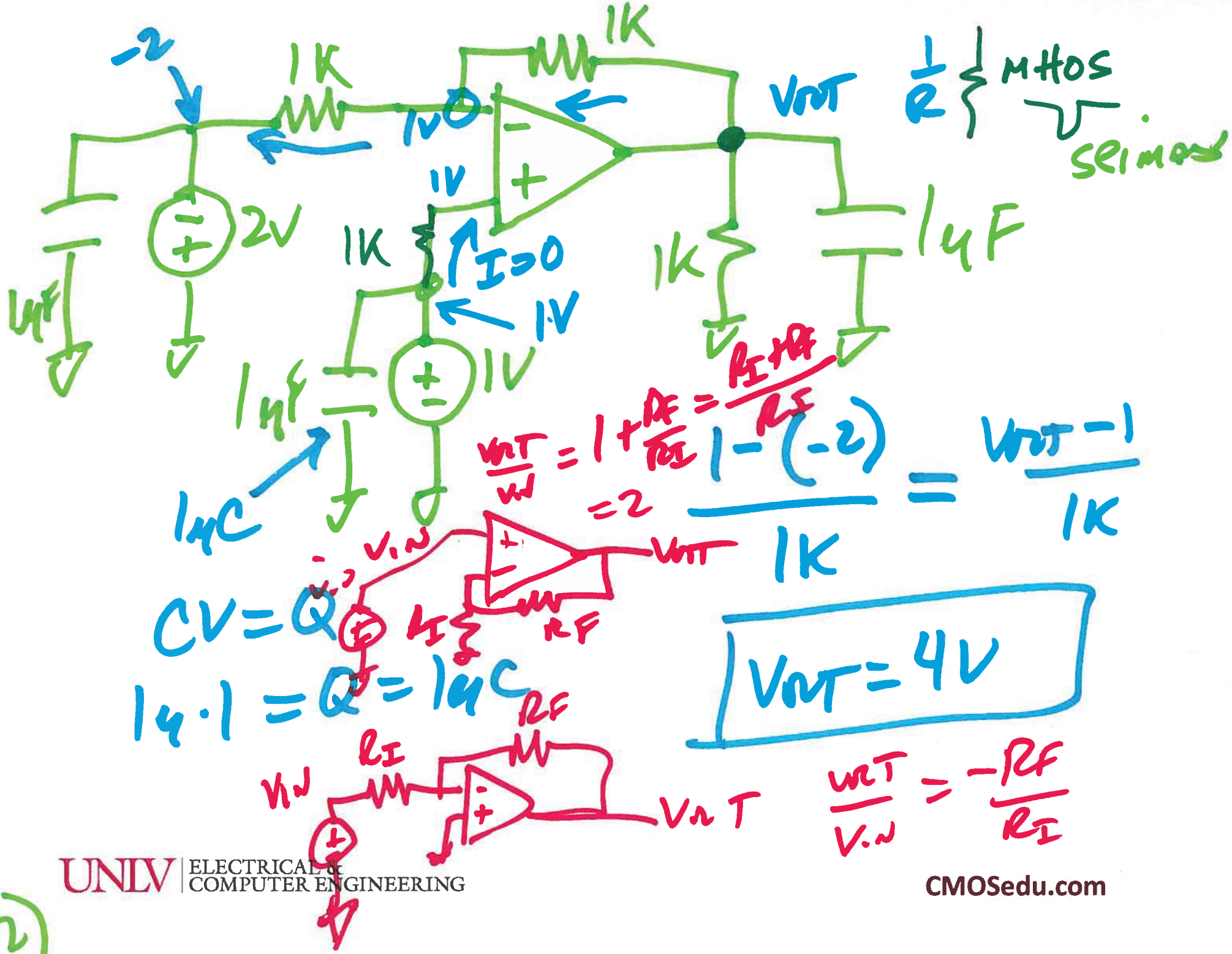
$$I = C\frac{dV}{dT}$$

$$V = \frac{1}{C}\int_{t_{init}}^{t_{final}} I \cdot dT$$

C = FARADS

Q = Columbs

V = Volts



$$\frac{V_{OUT}}{V_{IN}} = 1 + \frac{R_F}{R_I} = \frac{R_I + R_F}{R_I}$$

$$\frac{1 - (-2)}{1K} = \frac{V_{OUT} - 1}{1K}$$

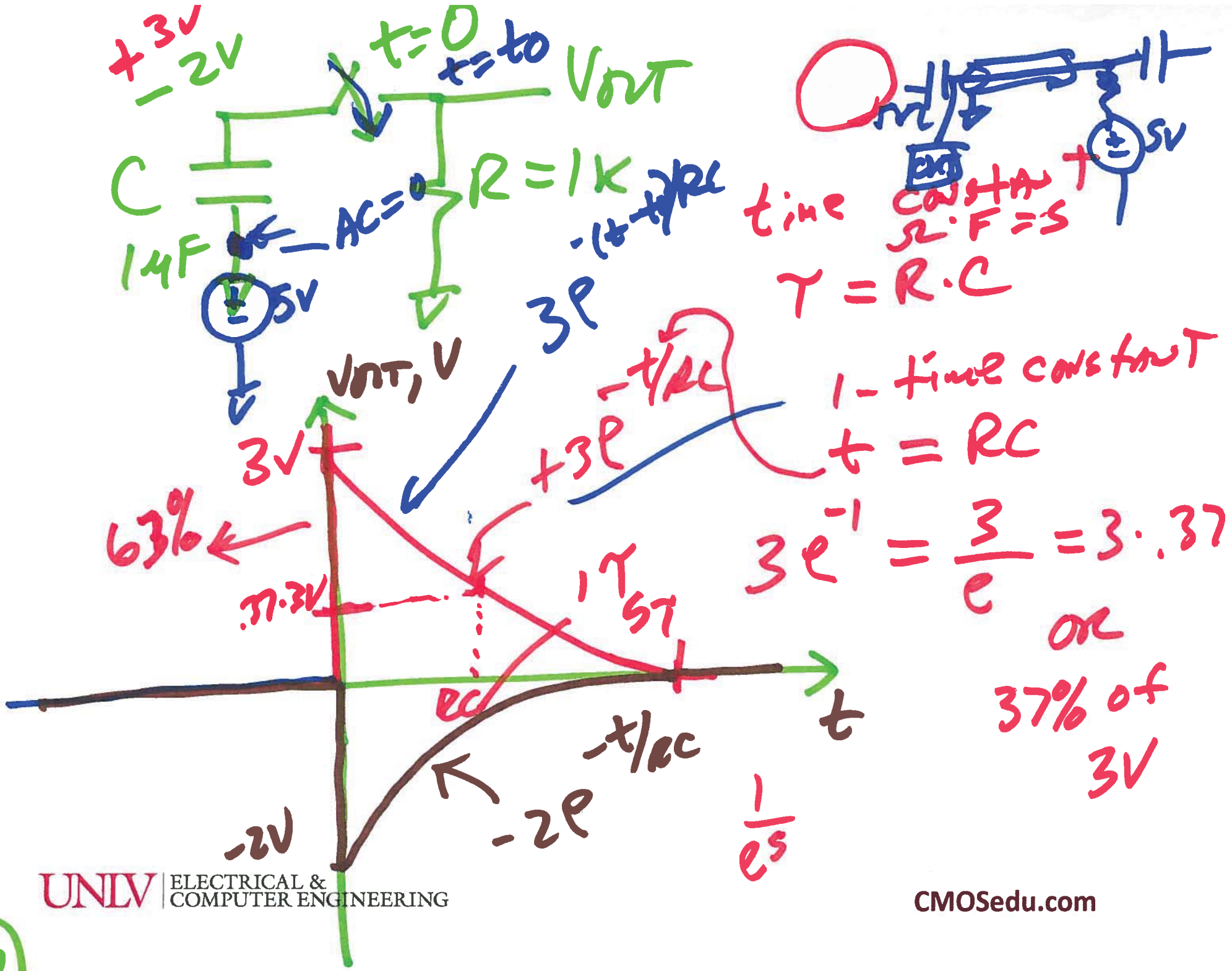
$$\frac{V_{OUT}}{V_{IN}} = 2$$

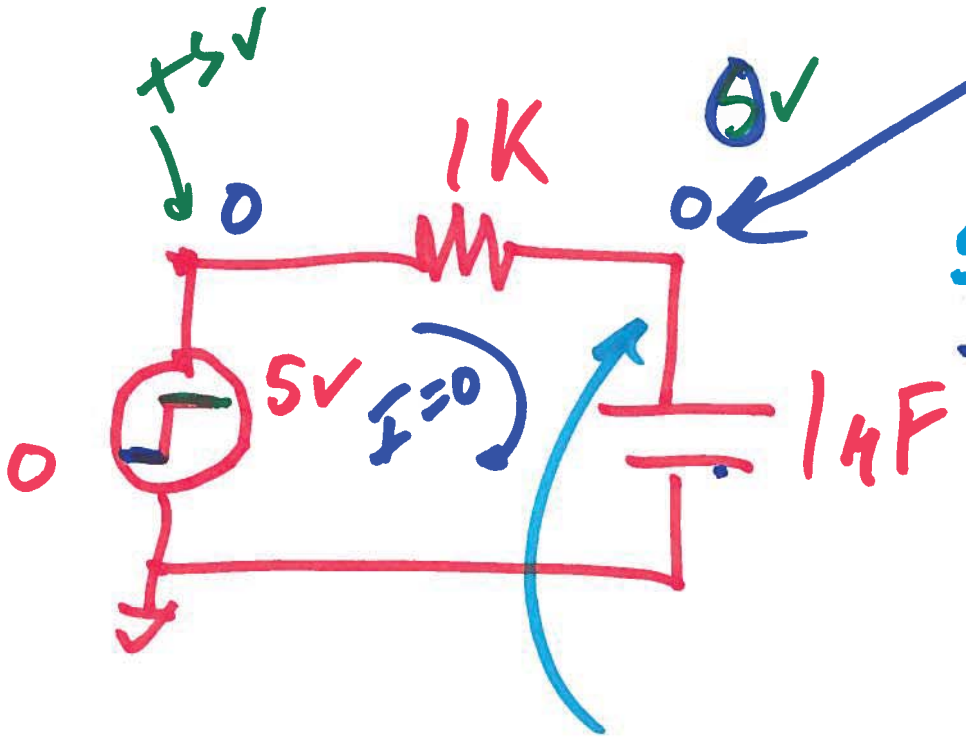
$$CV = Q$$

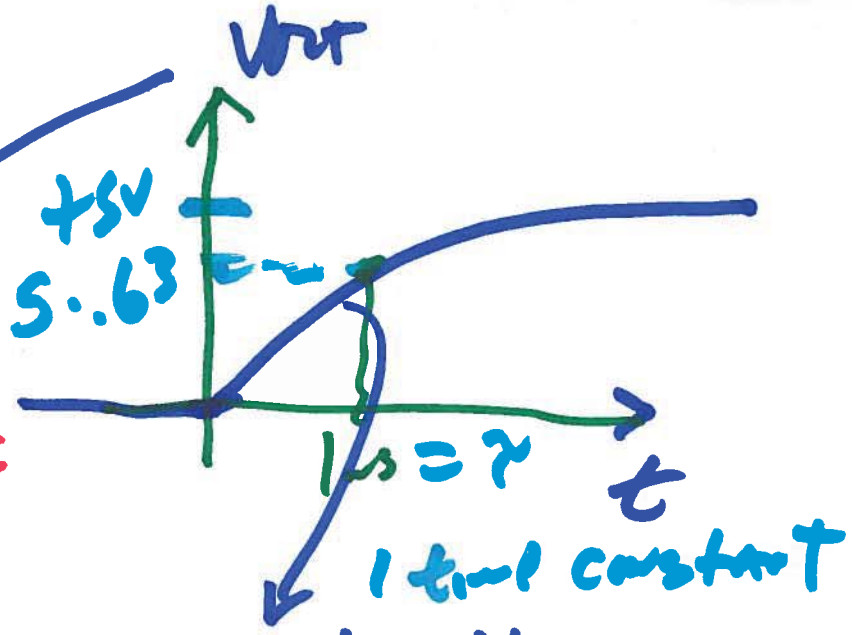
$$1\mu \cdot 1 = Q = 1\mu C$$

$$\boxed{V_{OUT} = 4V}$$

$$\frac{V_{OUT}}{V_{IN}} = -\frac{R_F}{R_I}$$

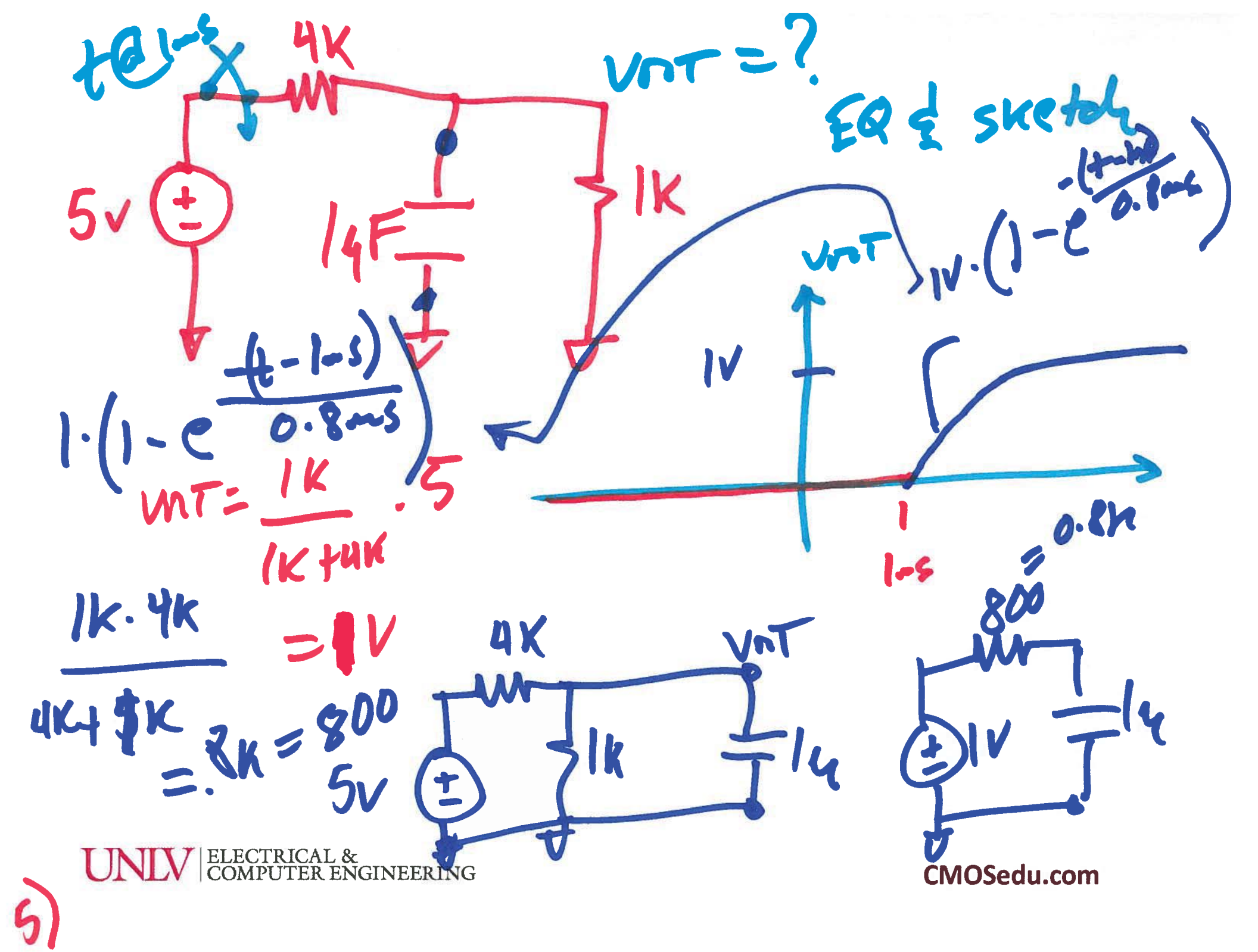

+3V
-2V
t=0
t=to
VOUT
C
1μF
AC=0
R=1K
5V
3e^-t/RC
VOUT, V
3V
63%
.37.3V
1τ
ec
t
-2e^-t/RC
-2V
time constant
Ω·F=s
τ = R·C
1- time constant
t = RC
3e^-1 = 3/e = 3·.37
or
37% of
3V
1/e^5





$$V_{out}(t) = V_{initial} \cdot \left(1 - e^{-t/RC}\right)$$

$$= 5 \cdot \left(1 - e^{-t/1ms}\right)$$



$$1\cdot\left(1-e^{\frac{-(t-1\text{-}s)}{0.8ms}}\right)\cdot 5$$

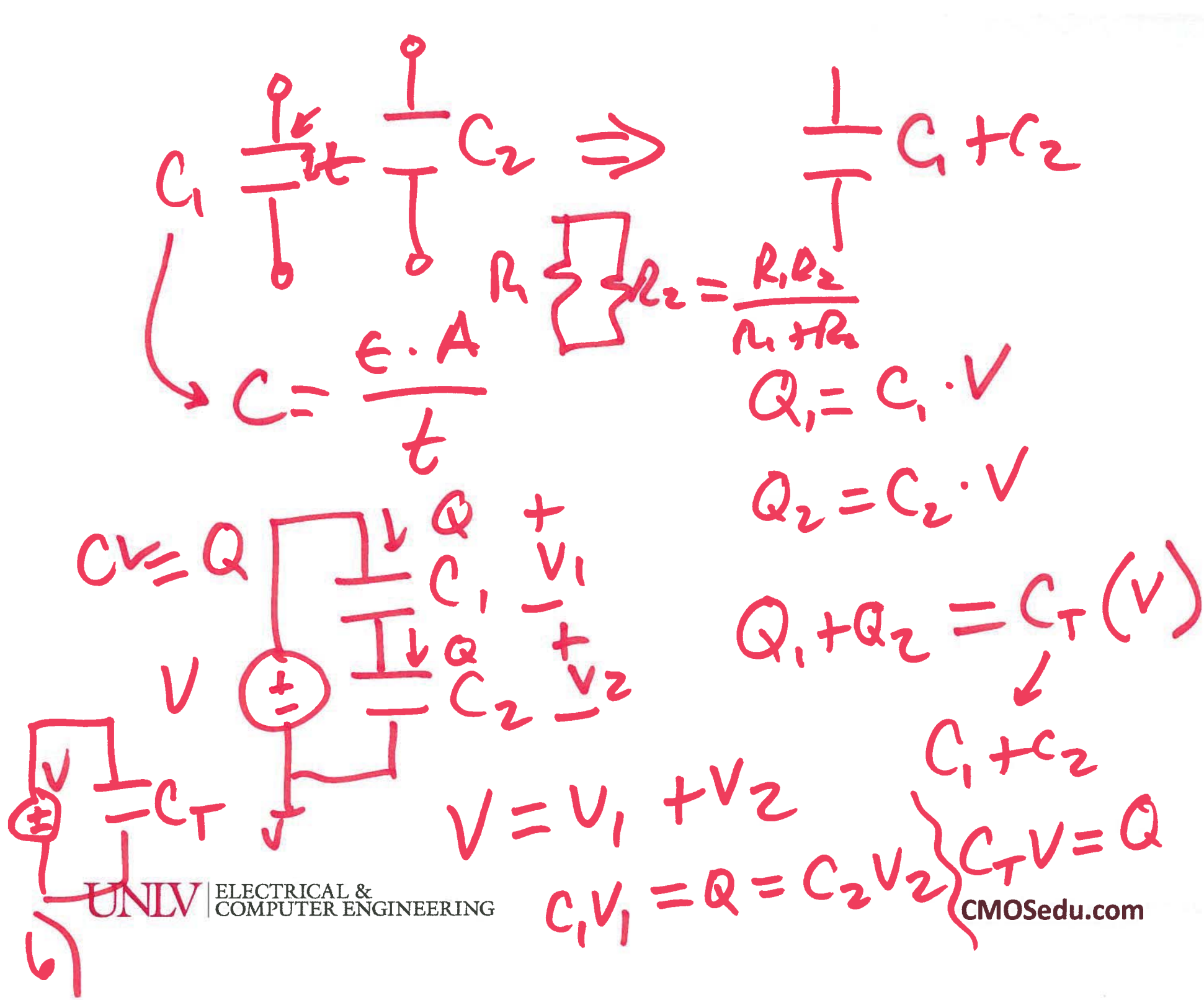
$$V_{oT}=\frac{1K}{1K+4K}$$

$$\frac{1K\cdot 4K}{4K+1K}=.8K=800$$

$$=1V$$

$$1V\cdot\left(1-e^{\frac{-(t-1\text{-}s)}{0.8ms}}\right)$$

$$0.8K=800$$


C1
C2
⇒
C1+C2
R1
R2
$R_2 = \frac{R_1 R_2}{R_1 + R_2}$
$C = \frac{\epsilon \cdot A}{t}$
$Q_1 = C_1 \cdot V$
$Q_2 = C_2 \cdot V$
$CV = Q$
Q
+
V_1
C_1
−
Q
+
V_2
C_2
−
V
C_T
$Q_1 + Q_2 = C_T(V)$
$C_1 + C_2$
$V = V_1 + V_2$
$C_T V = Q$
$C_1 V_1 = Q = C_2 V_2$
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$$C_T \cdot V = Q = C_T \cdot (V_1 + V_2)$$

$$V_1 = \frac{Q}{C_1} \qquad V_2 = \frac{Q}{C_2}$$

$$C_T \cdot \cancel{V}^{V_1+V_2} = C$$

$$C_T \left(\frac{\cancel{Q}}{C_1} + \frac{\cancel{Q}}{C_2} \right) = \cancel{Q}$$

$$C_T = \frac{C_1 \cdot C_2}{C_1 + C_2} \qquad \frac{1}{C_T} = \frac{C_2}{C_2 C_1} + \frac{C_1}{C_2 C_1}$$