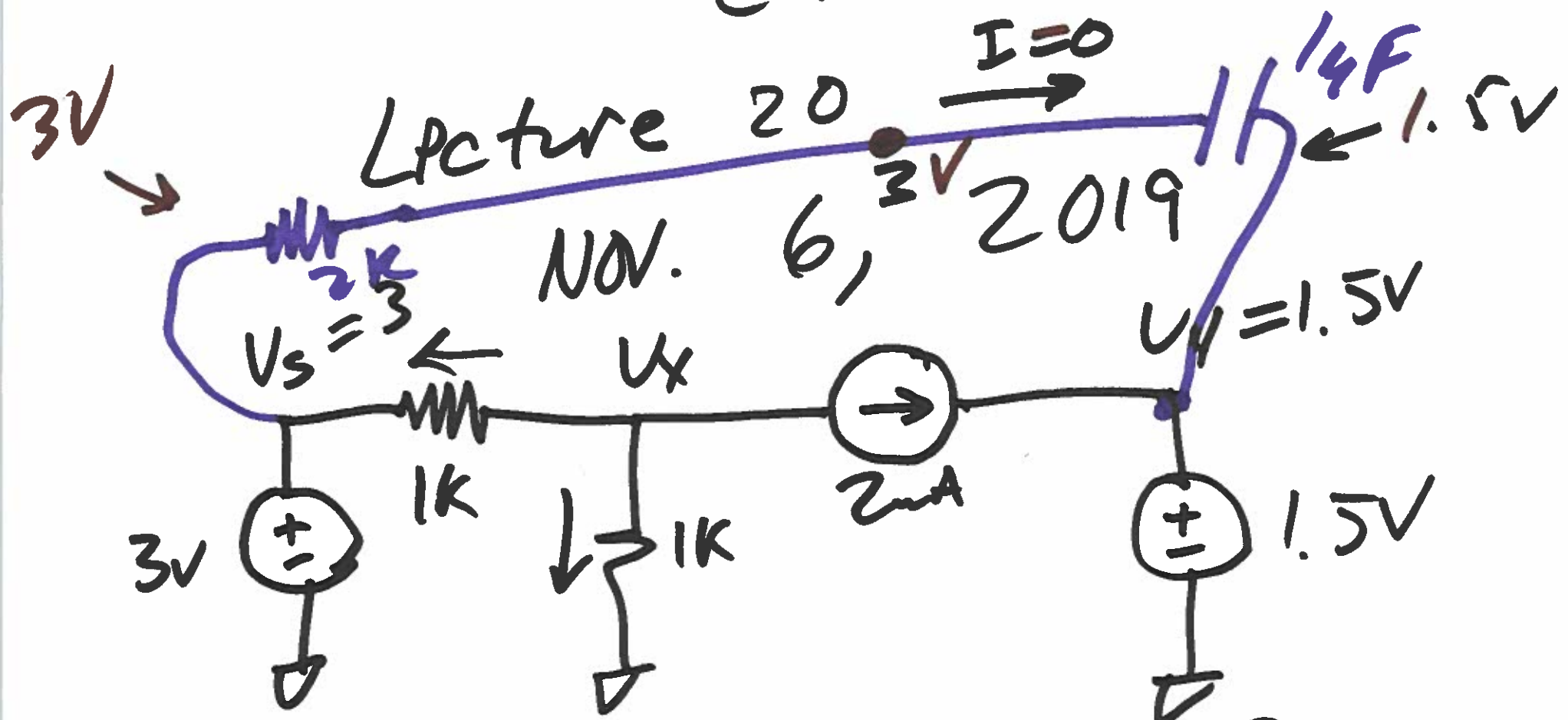


# EE 220

## Circuits 1



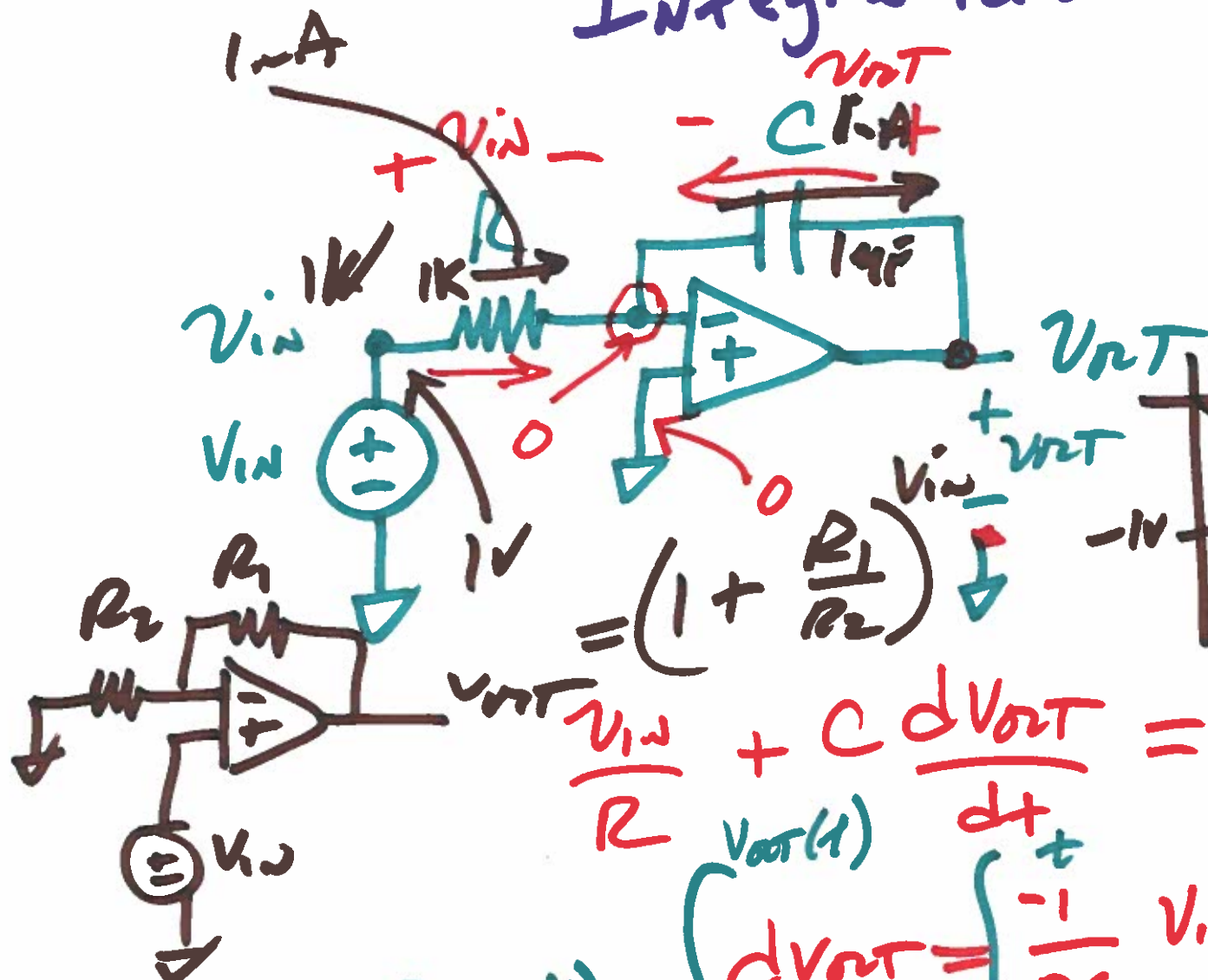
$$\frac{V_x}{1k} + 2A + \frac{V_x - 3}{1k} = 0$$

# Integrators

$$Cv = Q$$

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

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



$$= \left(1 + \frac{R_1}{R_2}\right) V_{in}$$

$$\frac{V_{in}}{R} + C \frac{dV_{out}}{dt} = 0$$

$$V_{out}(t) = \int_0^t dV_{out} = \int_0^t \frac{-1}{RC} V_{in} \cdot dt = \frac{-1}{RC} V_{in} \cdot t$$

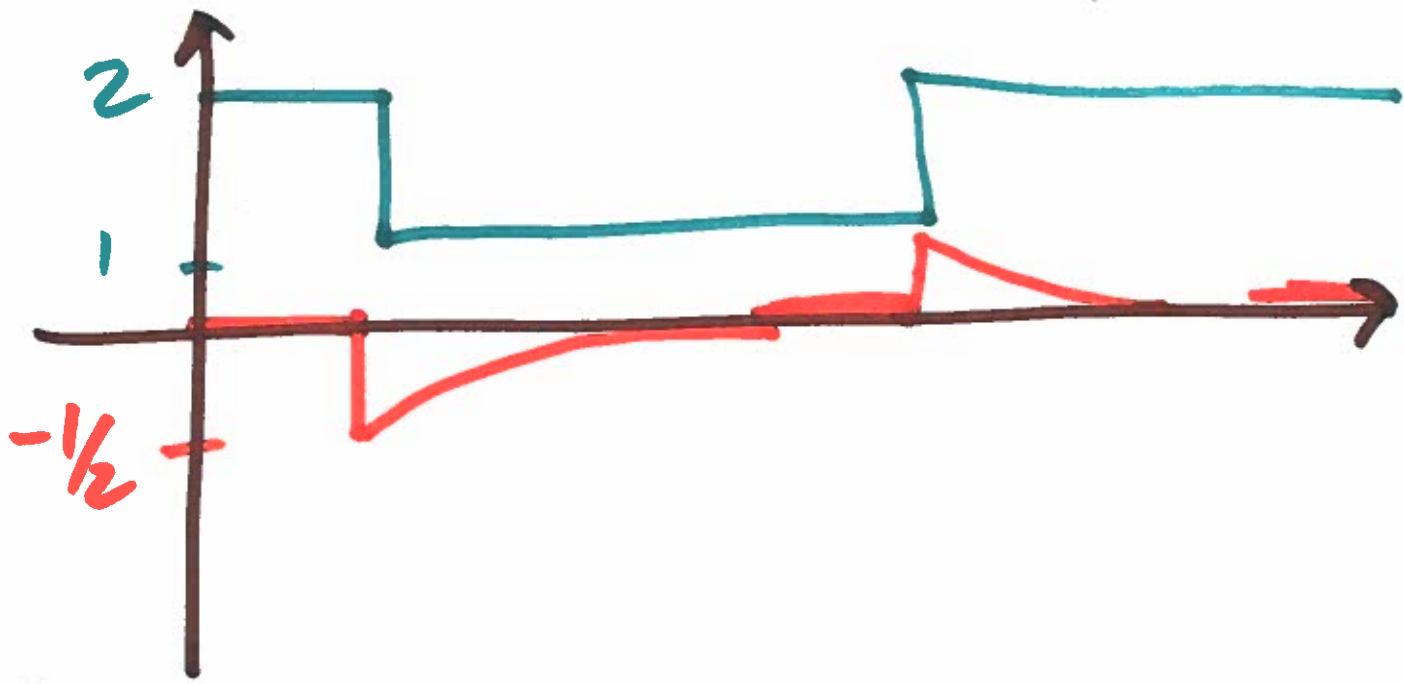
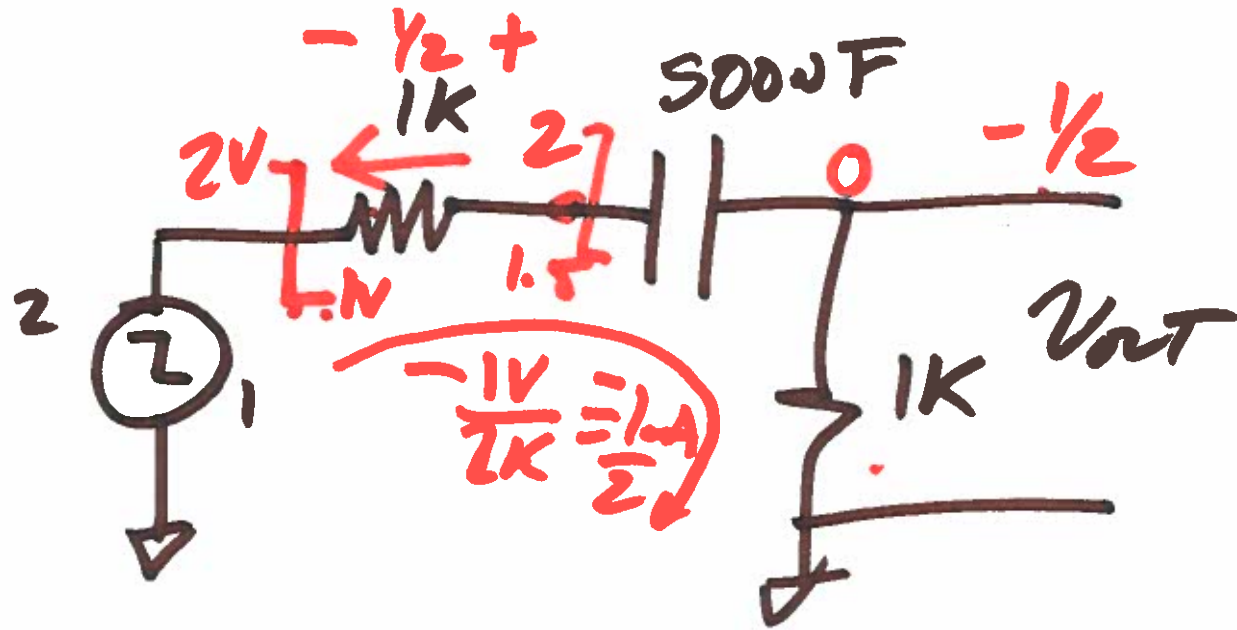
$$= \frac{1V}{104} \cdot \frac{1}{10^{-9}} \cdot t$$

$$= \frac{1V}{ms} \cdot t$$

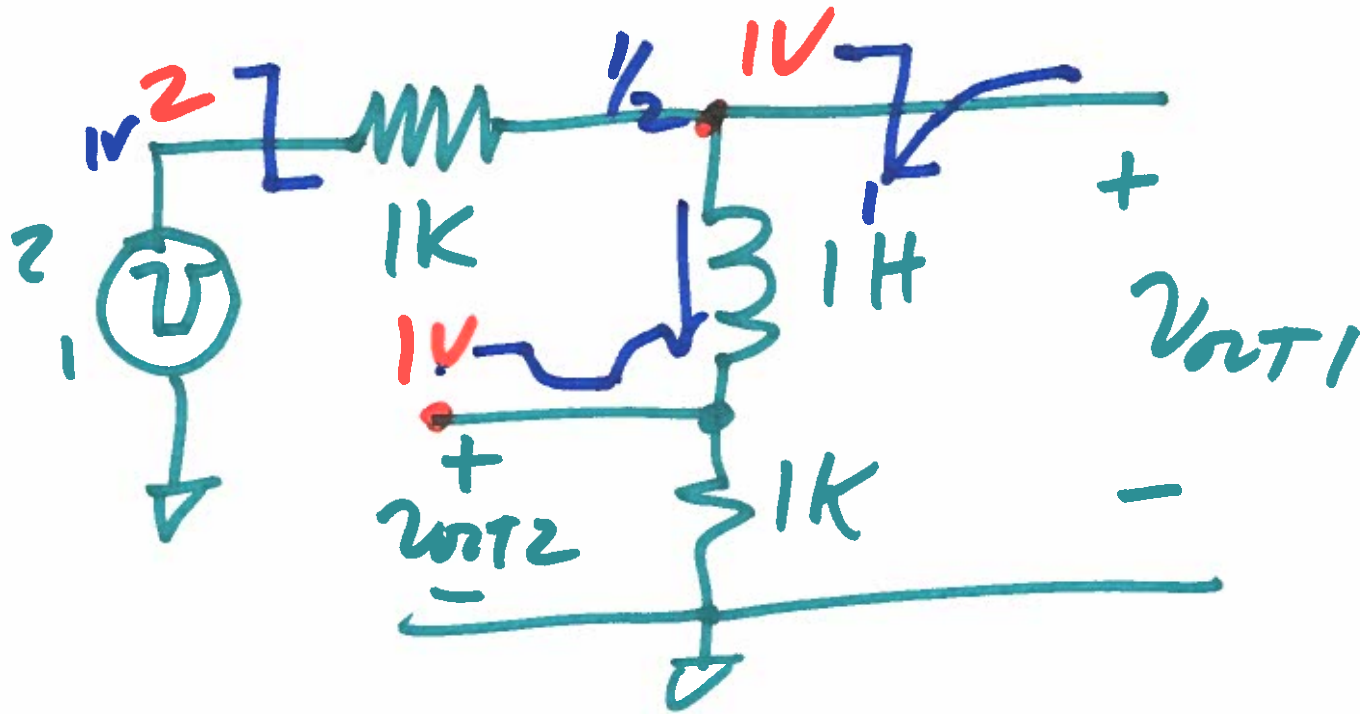
2)

$$\int_{V_{in}(t)}^{V_{out}(t)} dV_{out}(t) = \int_0^t -\frac{1}{RC} V_{in}(t) \cdot dt$$

$$V_{out} = -\frac{1}{RC} \int V_{in}(t) dt$$



4)



5)