



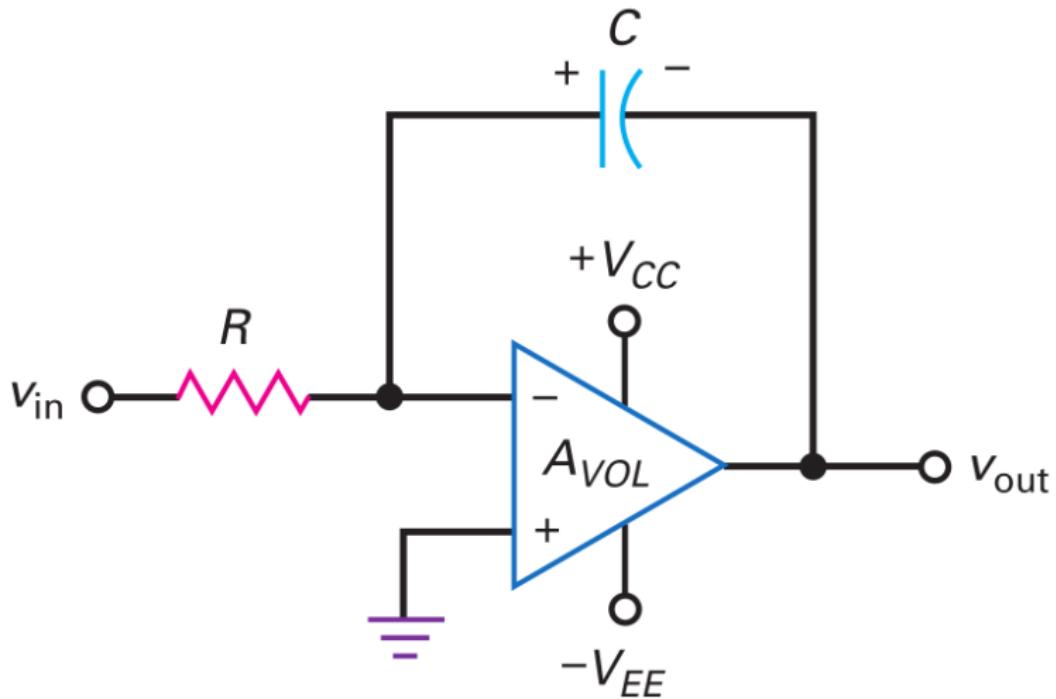
# Electronic Circuit II

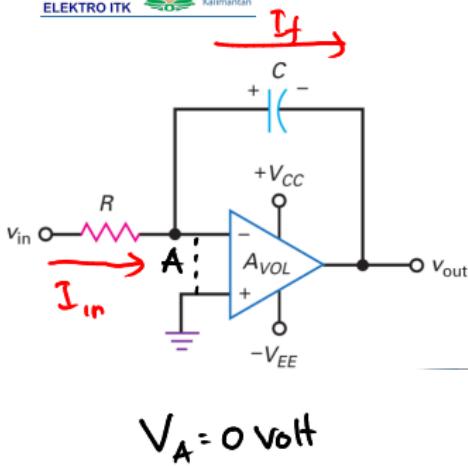
## Integrator and Differentiator Amplifier

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23 March 2023

# Integrator Amplifier





## Integrator Amplifier

$$t_{in} = I_f$$

$$\frac{V_{in} - V_A}{R} = C \cdot \frac{d(V_A - V_{out})}{dt}$$

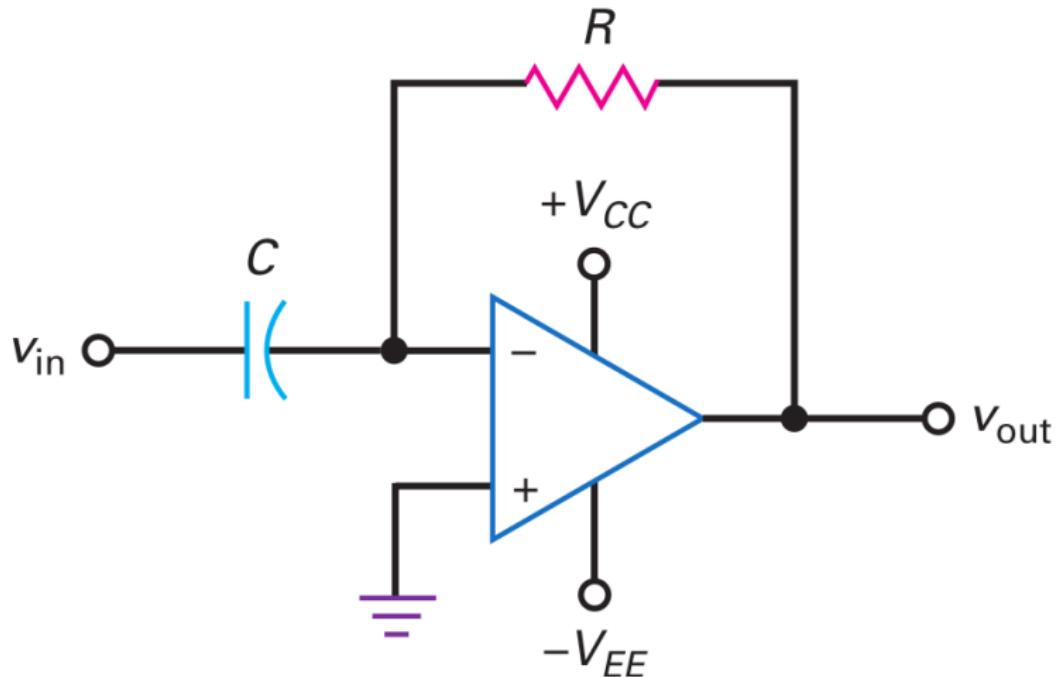
$$\frac{V_{in}}{R} = C \cdot \frac{d(-V_{out})}{dt}$$

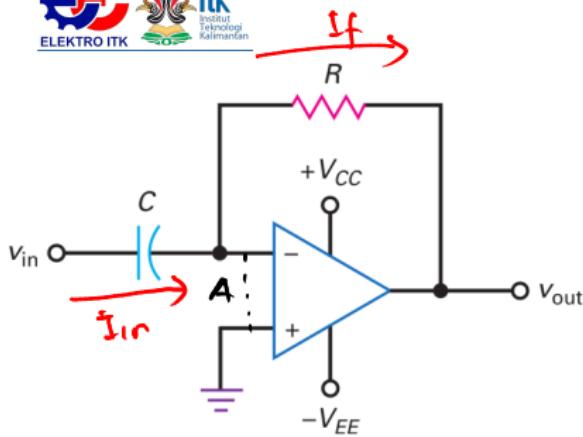
$$\frac{V_{in}}{RC} = - \frac{d(V_{out})}{dt}$$

$$-\int \frac{V_{in}}{RC} dt = V_{out}$$

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

# Differentiator Amplifier





$$V_A = 0 \text{ volt}$$

## Differentiator Amplifier

$$I_{in} = I_f$$

$$C \cdot \frac{d(V_{in} - V_A)}{dt} = \frac{V_A - V_{out}}{R}$$

$$C \cdot \frac{d(V_{in})}{dt} = -\frac{V_{out}}{R}$$

$$-CR \cdot \frac{d(V_{in})}{dt} = V_{out}$$

$$V_{out} = -CR \frac{d(V_{in})}{dt}$$