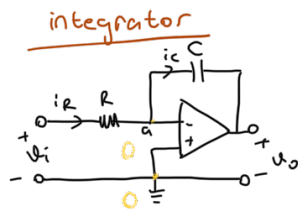# integrator and differentiator opamps
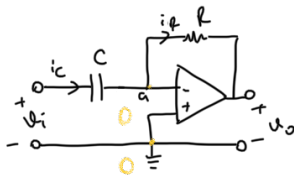
integrator

$$-i_R + i_C = 0$$

$$i_R = i_C$$

$$\frac{v_i}{R} = \frac{C \cdot d(0 - v_o)}{dt}$$

$$\frac{v_i}{R} = -C \frac{dv_o}{dt}$$

$$\boxed{v_o = -\frac{1}{RC} \int_0^t v_i \cdot dt}$$

differentiator

$$i_C = i_R$$

$$C \cdot \frac{dv_i}{dt} = -\frac{v_o}{R}$$

$$\boxed{v_o = -RC \frac{dv_i}{dt}}$$