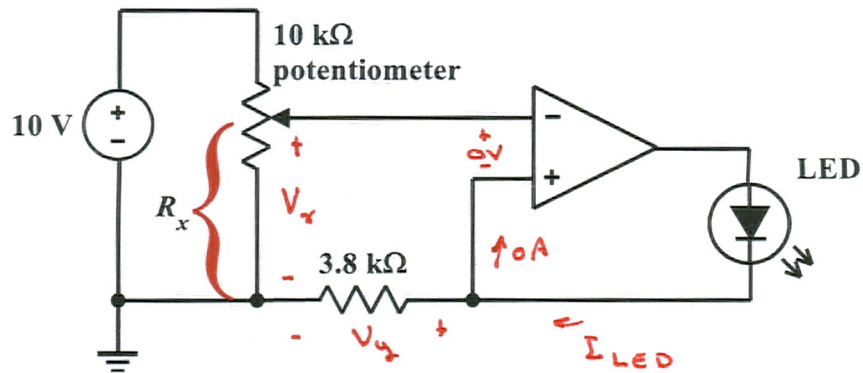


## Homework Problem #03

In the circuit shown below, the brightness of the LED (light-emitting diode) can be controlled by turning the knob of the 10 k $\Omega$  potentiometer. The current through the LED is supplied by the op amp.



Assume the op amp is ideal, and find the magnitude of the LED current if the potentiometer is set at:

(a)  $R_x = 5 \text{ k}\Omega$

$$V_x = \frac{R_x}{10 \text{ k}\Omega} \cdot 10 \text{ V} = R_x \times 10^{-3} \text{ V}$$

$$V_g = V_x$$

$$I_{\text{LED}} = \frac{V_g}{3.8 \text{ k}\Omega} = \frac{R_x \times 10^{-3}}{3.8 \times 10^3} = \frac{5 \times 10^3 \times 10^{-3}}{3.8 \times 10^3} = \frac{25}{19} \text{ mA}$$

$$\approx 1.316 \text{ mA}$$

(b)  $R_x = 8 \text{ k}\Omega$

$$I_{\text{LED}} = \frac{8 \times 10^3 \times 10^{-3}}{3.8 \times 10^3} = \frac{40}{19} \text{ mA} \approx 2.105 \text{ mA}$$