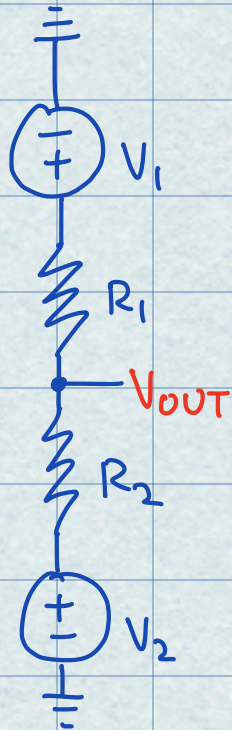


## DC offset



$$\frac{V_1 - V_{OUT}}{R_1} = \frac{V_2 - V_{OUT}}{R_2}$$

$$\frac{V_1}{R_1} - \frac{V_2}{R_2} = \frac{V_{OUT}}{R_1} - \frac{V_{OUT}}{R_2}$$

$$\frac{R_2 V_1 - R_1 V_2}{R_1 R_2} = \frac{R_2 V_{OUT} - R_1 V_{OUT}}{R_1 R_2}$$

$$R_2 V_1 - R_1 V_2 = (R_2 - R_1) V_{OUT}$$

$$V_{OUT} = \frac{R_2 V_1 - R_1 V_2}{R_2 - R_1}$$

★  $V_1 = 3.3\text{ V}$  (from power supply)

★  $V_2 \approx 0.3 \sin(\omega t)\text{ V}$  (guitar signal) test to see voltage range

Choose  $R_1$  and  $R_2 \longrightarrow 0 \leq V_{OUT} \leq 1$  - min value = 0 V

$$V_{OUT} = \frac{R_2 V_1 - R_1 V_2}{R_2 - R_1}$$

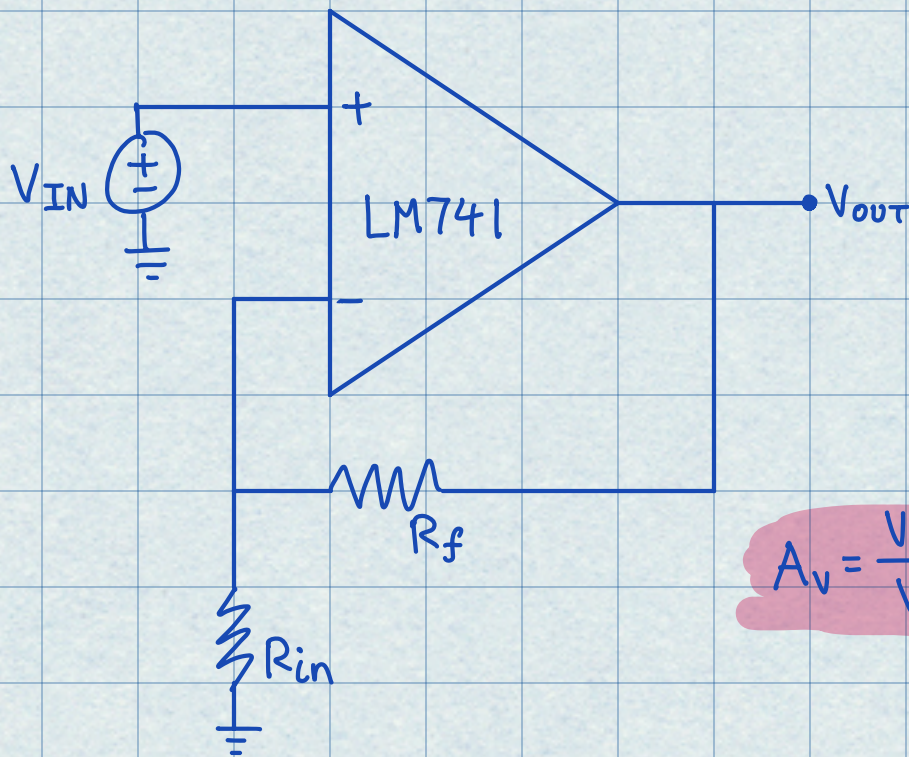
$$0 = \frac{R_2(3.3) - R_1(-0.3)}{R_2 - R_1}$$

→ lowest sine wave voltage

$$0 = 3.3R_2 + 0.3R_1 \longrightarrow R_1 \geq 11R_2 \text{ make sure } V_{OUT} \geq 0$$

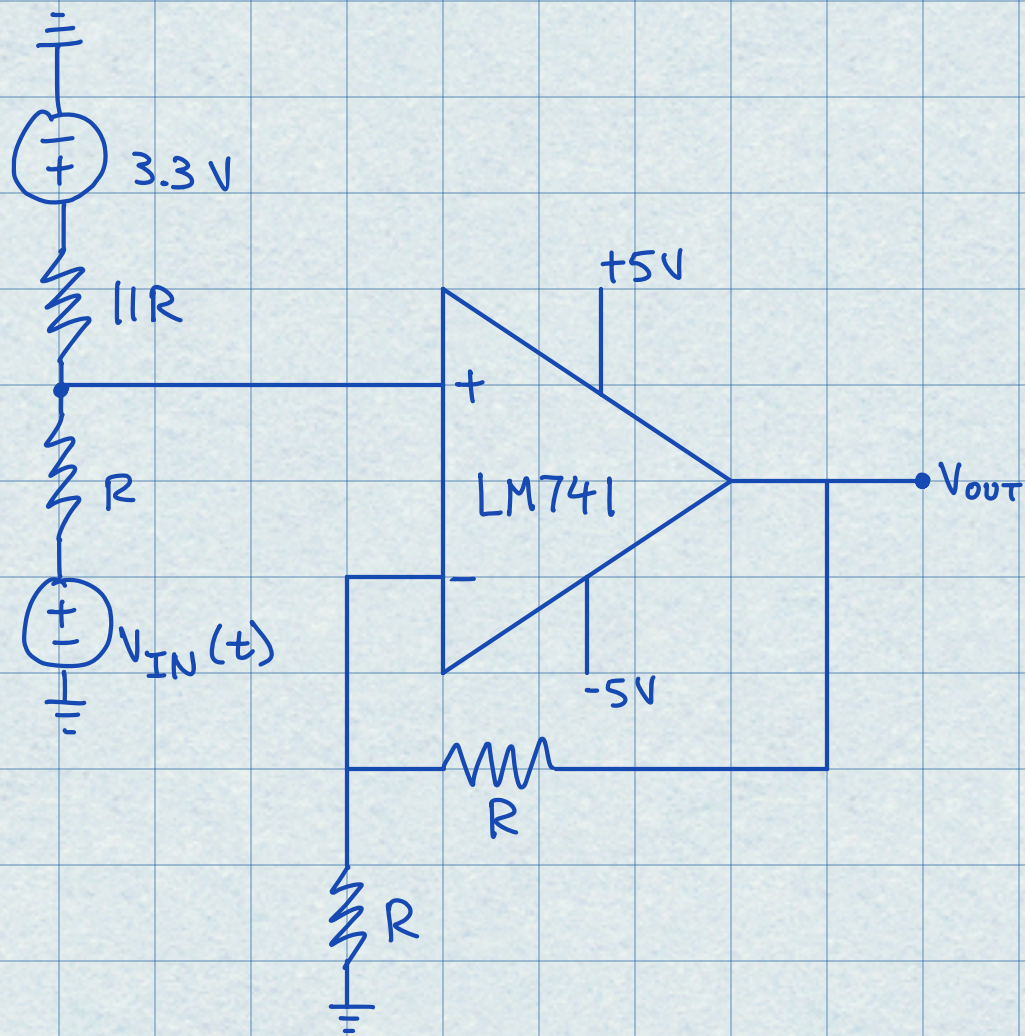


## Signal gain



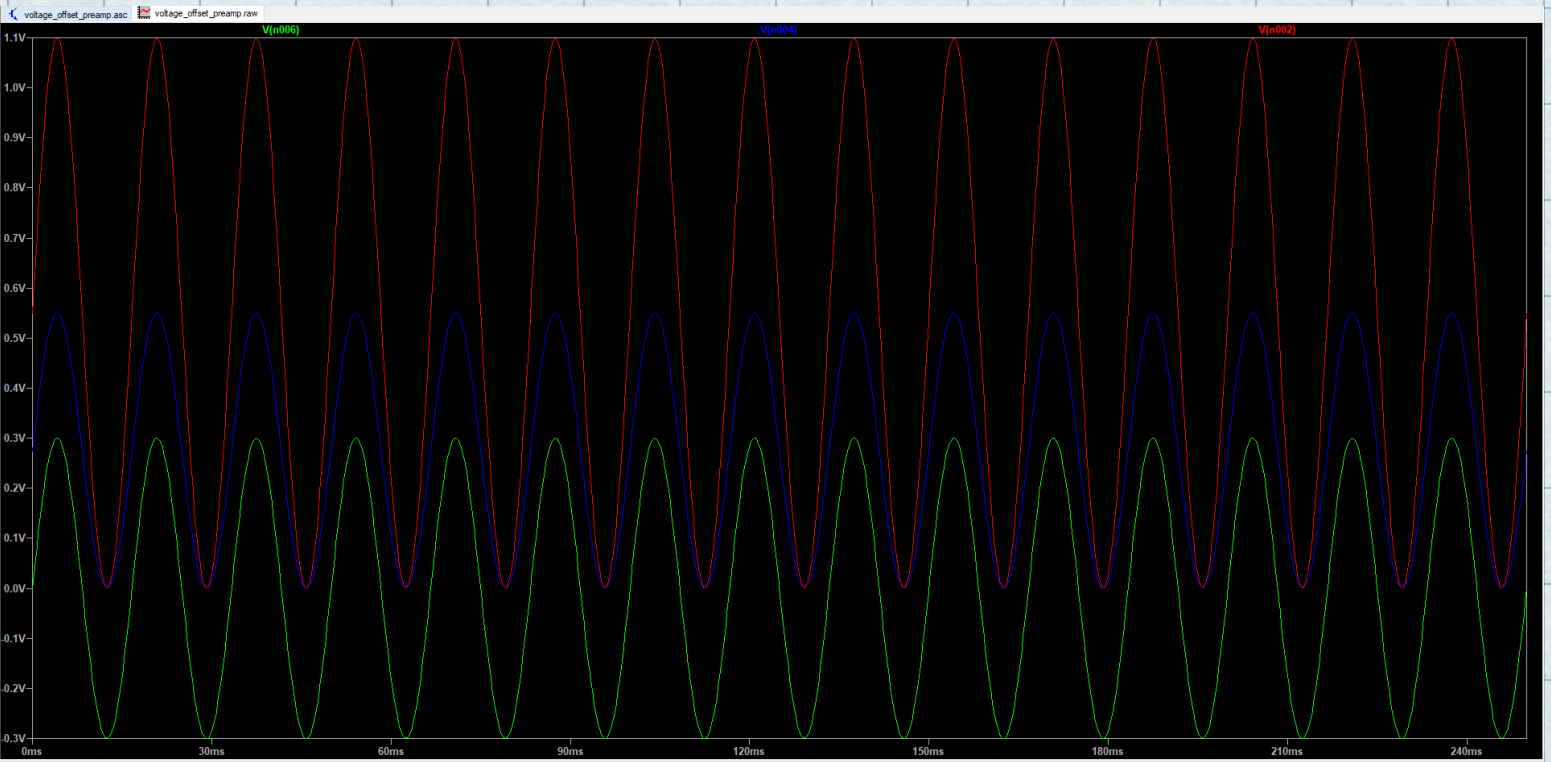
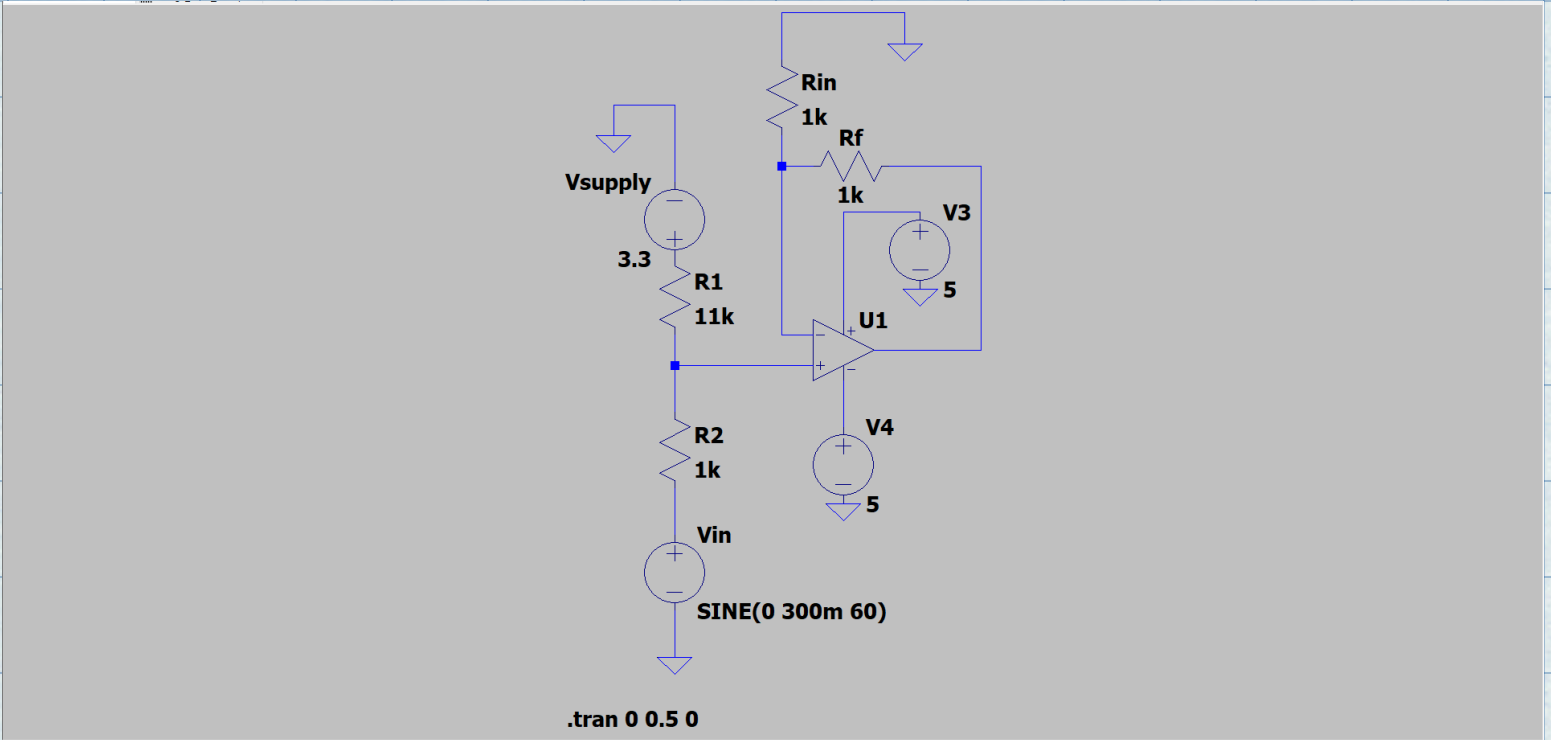
$$A_v = \frac{V_{OUT}}{V_{IN}} = 1 + \frac{R_f}{R_{in}}$$





- Perform tolerance calculations for resistor values





$V_{IN}$   
 $V_{offset}$   
 $V_{OUT}$