1. [10 points] Design an inverting amplifier using an ideal operational amplifier with a closed loop gain of \(-10\text{V/V}\). For an output voltage range given as \(-5\text{V} \leq v_0 \leq +5\text{V}\), the current in the feedback resistor must be less than 100\(\mu\text{A}\).

\[
\frac{v_0}{v_s} = -\frac{R_2}{R_1} = -10 \quad R_2 = 10R_1
\]

\[
v_0 = -10v_s
\]

\[
v_s = \frac{v_0}{-10} = \frac{5}{-10} = -\frac{1}{2}
\]

\[
\frac{v_0 - 0}{R_2} \leq 100\mu\text{A}
\]

\[
R_2 \geq \frac{5}{100\mu\text{A}} = 50\text{k}\Omega
\]

\[
R_1 = 5\text{k}\Omega \quad R_2 = 50\text{k}\Omega
\]

2. [10 points] Design a weighted summer using an ideal operational amplifier in an inverting configuration to get \(v_0 = -3v_a - 5v_b\). Keep your resistor values in the range of 1k\(\Omega\) to 1M\(\Omega\).

\[
v_0 = -\frac{R_f}{R_a} v_a - \frac{R_f}{R_b} v_b
\]

\[
= -3v_a - 5v_b
\]

\[
\frac{R_f}{R_a} = 3 \quad \frac{R_f}{R_b} = 5
\]

\[
3R_a = 5R_b \quad \frac{R_a}{R_b} = \frac{3}{5}
\]

\[
R_b = 30\text{k}\Omega \quad R_f = 150\text{k}\Omega
\]

\[
R_a = 50\text{k}\Omega
\]