1. **Op-Amp Rules and Negative Feedback Rule**
   
   Here is an equivalent circuit of an op-amp (where we are assuming that \( V_{SS} = -V_{DD} \)) for reference:

   ![Op-Amp Circuit](image)

   (a) What are the currents flowing into the positive and negative terminals of the op-amp (i.e., what are \( I^+ \) and \( I^- \))? Based on this answer, what are some of the advantages of using an op-amp in your circuit designs?

   (b) Suppose we add a resistor of value \( R_L \) between \( u_{out} \) and ground. What is the value of \( v_{out} \)? Does your answer depend on \( R_L \)? In other words, how does \( R_L \) affect \( A v_C \)? What are the implications of this with respect to using op-amps in circuit design?

   For the rest of the problem, consider the following op-amp circuit in negative feedback:

   ![Op-Amp Circuit with Negative Feedback](image)

   (c) Assuming that this is an ideal op-amp, what is \( v_{out} \)?

   (d) Draw the equivalent circuit for this op-amp and calculate \( v_{out} \) in terms of \( A \), \( v_{in} \), and \( R_L \) for the circuit in negative feedback. Does \( v_{out} \) depend on \( R_L \)? What is \( v_{out} \) in the limit as \( A \to \infty \)?

2. **An Inverting Amplifier**
(a) Calculate $v_{\text{out}}$ as a function of $V_s$ and $R_1$ and $R_2$.

3. **Charge Sharing**

Consider the circuit shown below. In phase $\phi_1$, the switches labeled $\phi_1$ are on while the switches labeled $\phi_2$ are off. In phase $\phi_2$, the switches labeled $\phi_2$ are on while the switches labeled $\phi_1$ are off.

(a) Draw the polarity of the voltage (using $+$ and $-$ signs) across the two capacitors $C_1$ and $C_2$. (It doesn’t matter which terminal you label $+$ or $-$; just remember to keep these consistent through phase 1 and 2!)

(b) Redraw the circuit in phase $\phi_1$ and phase $\phi_2$. Keep your polarity from part (a) in mind.

(c) Find $V_{\text{out}}$ in phase $\phi_2$ as a function of $V_{\text{in}}$, $C_1$, and $C_2$.

(d) How will the charges be distributed in phase $\phi_2$ if we assume $C_1 \gg C_2$?