### Ideal Operational Amplifier

![Ideal Operational Amplifier Diagram]

Currents $I_+ = 0A$, $I_- = 0A$

Voltages $V_+ = V_-$

### Ideal Operational Amplifier with finite open-loop gain $A$

![Ideal Operational Amplifier with finite open-loop gain Diagram]

Currents $I_+ = 0A$, $I_- = 0A$

Voltages $V_+ \neq V_-$, $v_d = V_+ - V_- \neq 0$

### Junction Diode DC Model

For Ideal Diode, use 0V instead of 0.7V

![Junction Diode DC Model Diagram]

**ON** Anode-cathode current ($i_D > 0A$); Anode-cathode voltage ($v_D = 0.7V$)

**OFF** Anode-cathode current ($i_D = 0A$); Anode-cathode voltage ($v_D < 0.7V$)
Problem 1 (15 points)
Consider the circuit shown below where the opamp is ideal except for the finite open-loop gain $A$. Determine the output voltage $V_{out}$ as a function of the input sources $V_{in}$ and $I_{in}$.
Problem 1 (continued)
Problem 2 (10 points)
Consider the following circuit and assume that the opamps are ideal. Given the input voltage waveform for $v_{in}(t)$, determine and sketch the corresponding output voltages $v_{out1}(t)$ and $v_{out2}(t)$. Make sure that you label the axes of your graphs properly.
Problem 3 (10 points)
Consider the circuit shown below assuming that the opamp is ideal.
Determine the voltage gains $v_{out1}/v_{in}$ and $v_{out2}/v_{in}$.
Problem 4 (10 points)
Consider the circuit shown below with ideal diode $D$ and constant voltage source $V_0$ and input voltage $v_{in}$.
(a) For what range of voltages $v_{in}$ will the diode be OFF?
(b) For what range of voltages $v_{in}$ will the diode be ON?
(c) What will be the diode current for the ON condition of part (b)?
Extra Workspace