Non Inverting Amp Transfer Function Derivation

• Ideal op-amp conditions (simplify derivation)
  • virtual short at inputs (voltage at + same as at - )
  • no current into input terminals

• Non-inverting amplifier gain transfer function
  • write equations of operation from schematic using Ohms law
    • \( V_x = R_1 \times i_1 \)
    • \( V_{out} - V_x = R_2 \times i_2 \)
  • apply ideal op-amp conditions
    • virtual short \( \rightarrow V_x = V_{in} \)
    • no input current \( \rightarrow i_1 = i_2 = i \)
  • thus
    • \( V_{in} = R_1 \times i \rightarrow i = V_{in}/R_1 \)
    • \( V_{out} - V_{in} = R_2 \times i \rightarrow i = (V_{out}-V_{in})/R_2 \)
  • and setting \( i = i \ldots \)
    • \( \rightarrow V_{in}/R_1 = (V_{out}-V_{in})/R_2 \rightarrow V_{out}/R_2 = V_{in}/R_1 + V_{in}/R_2 = V_{in} \left( \frac{1}{R_1} + \frac{1}{R_2} \right) \)
    • \( \rightarrow V_{out}/V_{in} = 1 + \frac{R_2}{R_1} \)