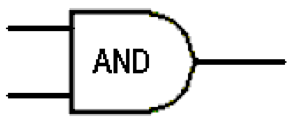
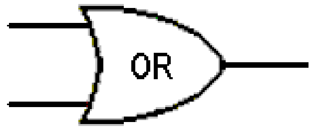
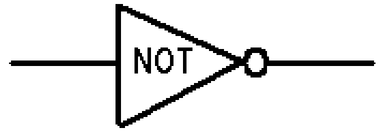
Logic Gates



A	B	$Y = A \bullet B$
0	0	0
0	1	0
1	0	0
1	1	1



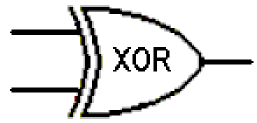
A	B	$Y = A + B$
0	0	0
0	1	1
1	0	1
1	1	1



A	$Y = \overline{A}$
0	1
1	0

A	B	$Y = \overline{A \bullet B}$
0	0	1
0	1	1
1	0	1
1	1	0

A	B	$Y = \overline{A + B}$
0	0	1
0	1	0
1	0	0
1	1	0



A	B	$Y = A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

Boolean Algebra Properties

$A \bullet 0 = 0$

$A + 0 = A$

$A \bullet 1 = A$

$A + 1 = 1$

$A \bullet A = A$

$A + A = A$

$\overline{\overline{A}} = A$

$A \bullet \overline{A} = 0$

$A + \overline{A} = 1$

$A \oplus B = \overline{A} \bullet B + A \bullet \overline{B}$

$\overline{A \oplus B} = \overline{A} \bullet \overline{B} + A \bullet B$

$A \bullet B = B \bullet A$

$A + B = B + A$

$A + A \bullet B = A$

$A \bullet (A + B) = A$

$A \bullet (\overline{A} + B) = A \bullet B$

$A + \overline{A} \bullet B = A + B$

$\overline{A} + A \bullet B = \overline{A} + B$

$\overline{A} + A \bullet \overline{B} = \overline{A} + \overline{B}$

$A \bullet (B + C) = A \bullet B + A \bullet C$

$A + B \bullet C = (A + B) \bullet (A + C)$

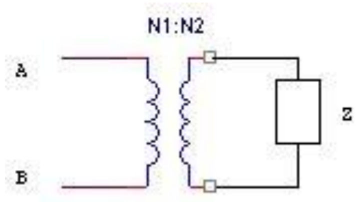
$A \bullet (B \bullet C) = (A \bullet B) \bullet C$

$A + (B + C) = (A + B) + C$

$\overline{A \bullet B} = \overline{A} + \overline{B}$

$\overline{A + B} = \overline{A} \bullet \overline{B}$

Transformers



ideal equations

$$a = \frac{N_2}{N_1} = \frac{V_2}{V_1} = \frac{I_1}{I_2} = \sqrt{\frac{L_2}{L_1}}$$

input impedance

$$Z_{in} = Z_{AB} = \frac{Z}{a^2}$$

ECSE-1010 **Crib Sheet** **Quiz 3**

DO NOT WRITE ON THIS SHEET **RETURN SHEET AFTER QUIZ**

Op-Amp Circuits

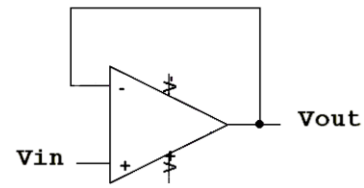
Op Amp Analysis Rules

1. $V_+ = V_-$
2. $I_+ = I_- = 0$

Op-Amp Analysis

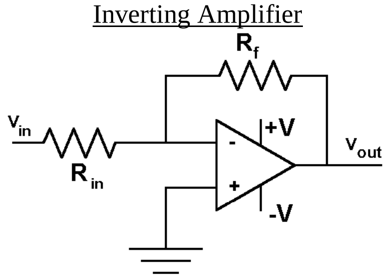
1. Remove Op-Amp
2. Draw a circuit at each input to the op-amp
3. Solve for Vout in terms of the input voltage(s).

Voltage Follower



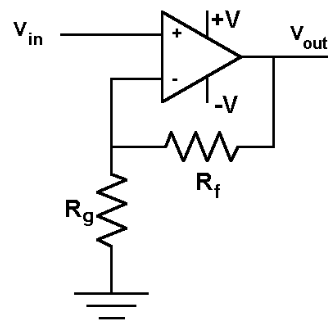
$$A_V = \frac{V_{out}}{V_{in}} = 1$$

Inverting Amplifier



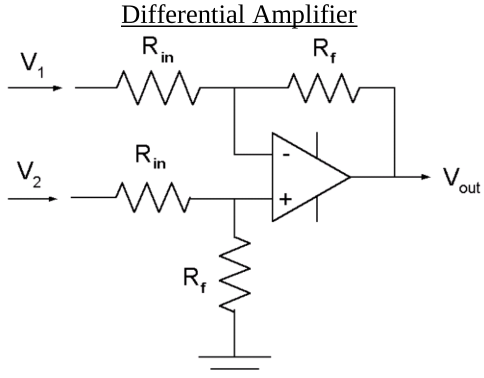
$$A_V = \frac{V_{out}}{V_{in}} = -\frac{R_f}{R_{in}}$$

Non-Inverting Amplifier



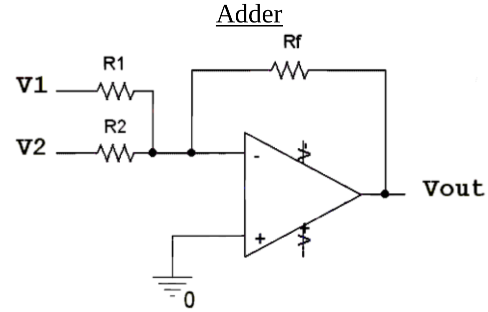
$$A_V = \frac{V_{out}}{V_{in}} = 1 + \frac{R_f}{R_g}$$

Differential Amplifier



$$V_{out} = \frac{R_f}{R_{in}}\left(V_2 - V_1\right)$$

Adder



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