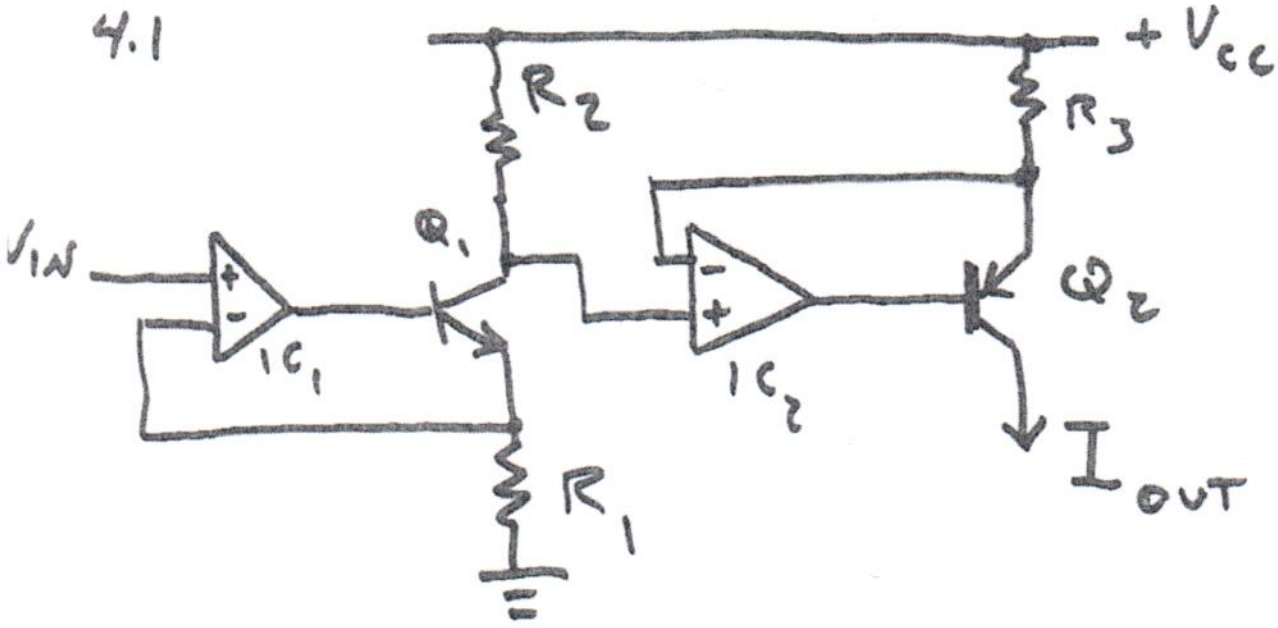
PHYS 4211

T. E. Cont

4.1



NOTE: BOTH OP-AMPS HAVE NEG. FEEDBA

$$I_{OUT} = \frac{V_{cc} - V_{E,Q_2}}{R_3}$$

NOW, $V_{E,Q_2} = V^+_{IC2} = V_{C,Q1}$ (NEG. FEEDB

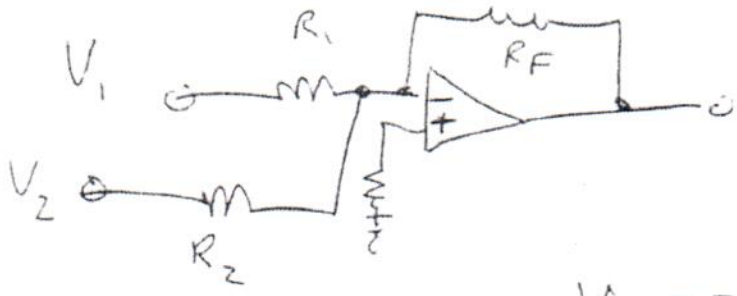
$$V_{C,Q1} = V_{cc} - I_{C,Q1} \cdot R_2$$

BUT, $I_{C,Q1} \simeq I_{E,Q1} = \frac{V_{IN}}{R_1}$

$$\Rightarrow V_{C,Q1} = V_{cc} - V_{IN}\frac{R_2}{R_1}$$

SO, $$\boxed{I = \frac{V_{cc} - \left(V_{cc} - V_{IN}\frac{R_2}{R_1}\right)}{R_3} = + \frac{V_{IN} R_2}{R_1 R_3}}$$

#2 APPLICATION OF SUMMING AMPS



$$V_{OUT} = -\left(\frac{R_F}{R_1}\right)V_1 \quad -\left(\frac{R_F}{R_2}\right)V_2$$

FROM CIRCUIT SKETCH

FROM CIRCUIT SKETCH

$$X = -(-c_1 + 100)\frac{R}{R} - b_1 y \; {}^{R}/_{R}$$

$$= +100c_1 - b_1 y \qquad (1)$$

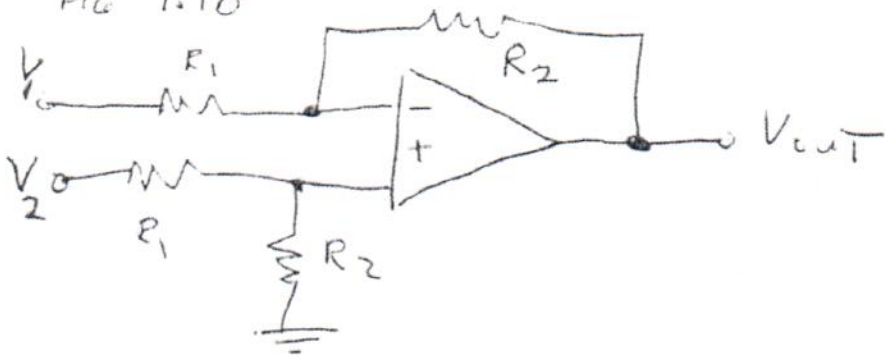
$$y = +(c_2 100)\,{}^{R}/_{R} - a_2 X \qquad (2)$$

$$a_2 X + y = +100\,c_2 \qquad (3)$$

(1) $\Rightarrow$ $\boxed{X + b_1 y = 100\,c_1}$

(3) $\Rightarrow$ $\boxed{a_2 X + y = 100\,c_2}$

FIG 4.18



NEGATIVE FEEDBACK $\Rightarrow V_- = V_+ = \left(\frac{R_2}{R_1+R_2}\right) V_2$

NOW, $V_- = V_1 - i R_1$

w/ $i = (V_1 - V_{OUT})/(R_1+R_2)$

$$V_- = V_1 - \left(\frac{V_1 - V_{OUT}}{R_1+R_2}\right) R_1$$

$$\left(\frac{R_2}{R_1+R_2}\right) V_2 = V_1 - \left(\frac{V_1 - V_{OUT}}{R_1+R_2}\right) R_1$$

$$V_2 R_2 = (R_1+R_2) V_1 - (V_1 - V_{OUT}) R_1$$

$$V_2 (R_2/R_1) = \left(\frac{R_1+R_2}{R_1}\right) V_1 - V_1 + V_{OUT}$$

$$\Rightarrow \boxed{V_{OUT} = (R_2/R_1)(V_2 - V_1)}$$