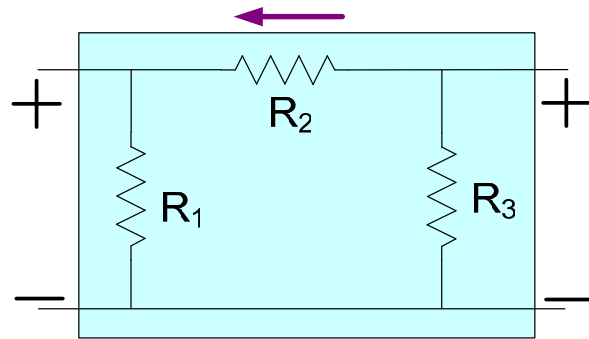EE 230
Homework 4
Spring 2010

Problem 1   Three β networks are shown along with the type of 'A' amplifier if this is
to be used in a standard feedback network. Determine the value of β in all three cases.
You may assume the port impedances of the A amplifier are ideal and that the signal
propagation through the β network is in the direction of the arrow.

Circuit 1   'A" amplifier is a voltage amplifier
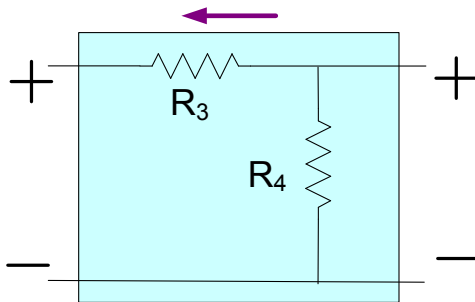
Circuit 2   'A' amplifier is a transresistance amplifier
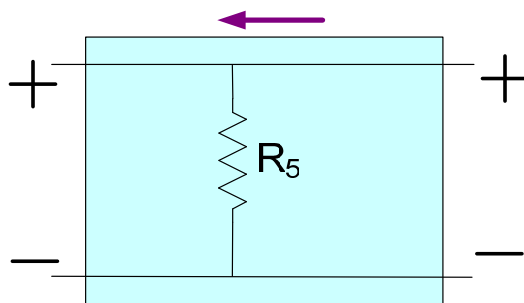
Circuit 3   'A' amplifier is a transconductance amplifier

Problem 2   Assume an A amplifier has an input impedance of 100K, an output impedance of 40Ω, and a nominal dc gain of 150. If the circuit is driving a 100Ω load with a signal generator that has an output impedance of 50Ω and an open-circuit output voltage of 0.5sin(500t+30°), determine the steady state output voltage.

Problem 3   A voltage amplifier has an input impedance of 100K, an output impedance of 40Ω, and a nominal dc gain of 150. If this drives a transresistance amplifier that has an input impedance of 80Ω, an output impedance of 4000Ω, and a nominal dc transresistance gain of 150V/A, determine the voltage gain of the circuit if the input comes from a signal generator with an output impedance of 80Ω.

Problem 4   The cascade of two amplifiers is shown.   This cascaded circuit can be redrawn as an amplifier of any of the 4 basic types.   Redraw this as a transcondukctance amplifier.
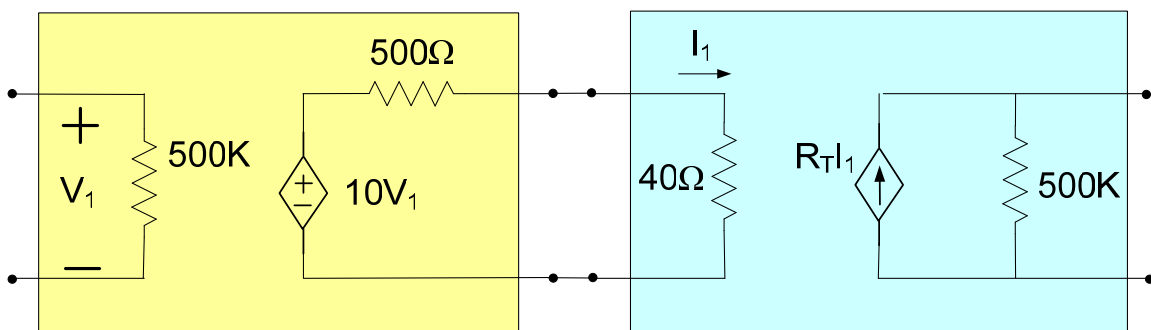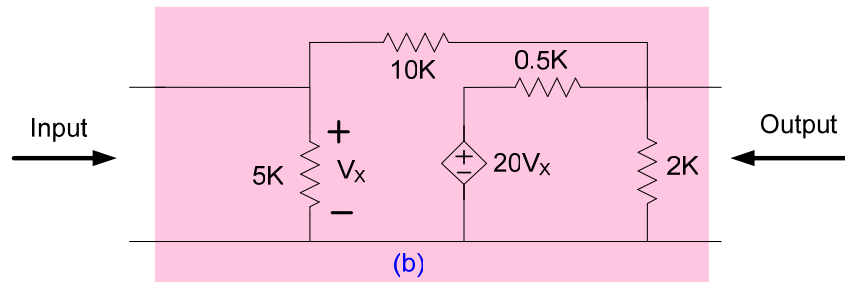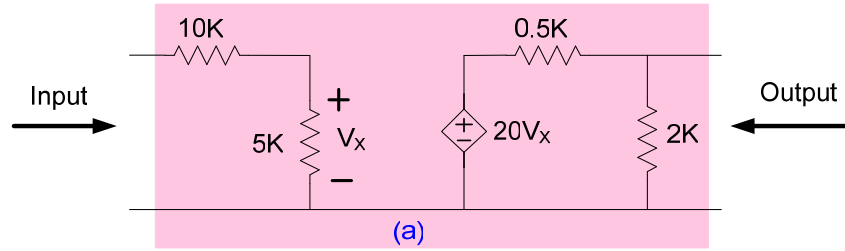
Problem 5   Assuming the op amp is ideal, determine the output voltage for the circuit shown
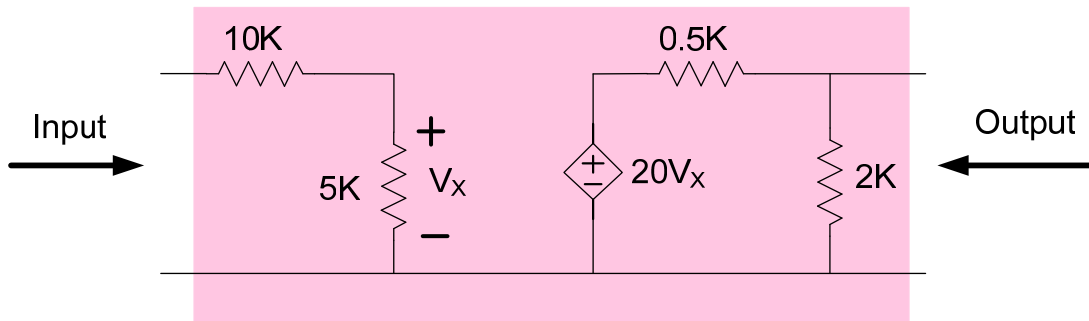
V_1 •

V_{OUT}

500K

10K

V_2 •
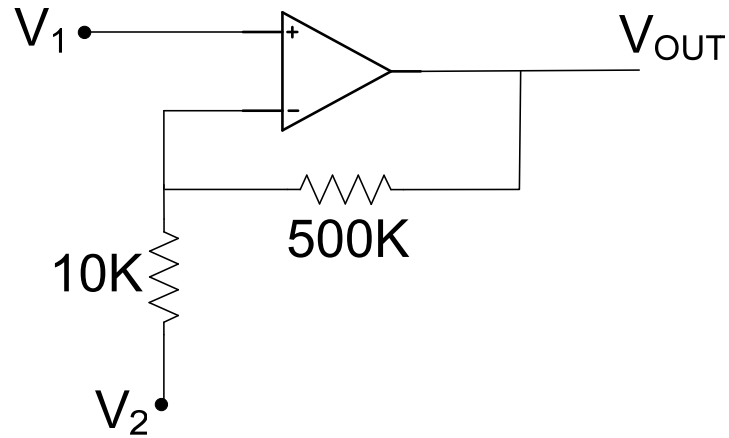
Problem 6   Assume the op amp is ideal. Determine the output voltage if V_{IN}=2u(t)

V_{OUT}

500K

0.1uF   10K

V_{IN} •
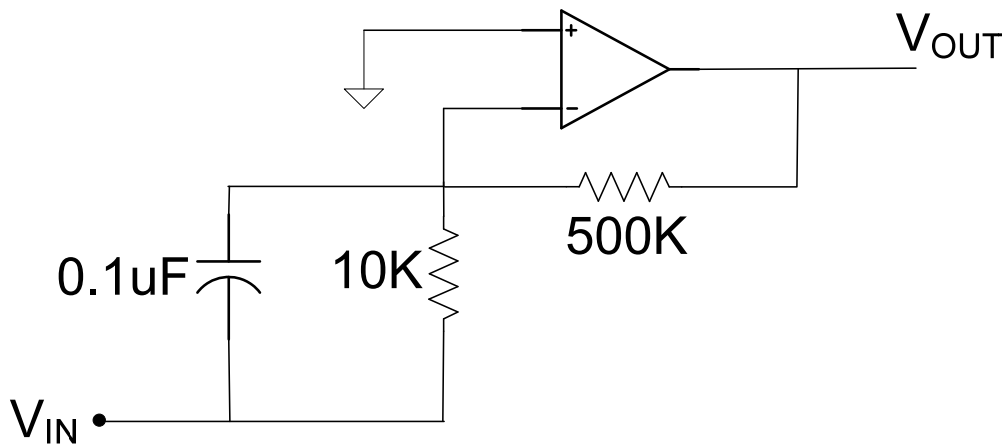
Problem 7   Determine whether the following two-port networks are unilateral and show how that determination is made

(a)

(b)

Problem 8   Determine the two-port parameters of the following circuit using Thevenin-Equivalent form on both ports

Problem 9   Assume a 1KHz sinusoidal source has a 1V RMS output signal and an output impedance of 500Ω. Determine the output voltage, the power transferred to the 1KΩ load and the power transfer efficiency in the following three circuits.

(a)

(b)

(c)
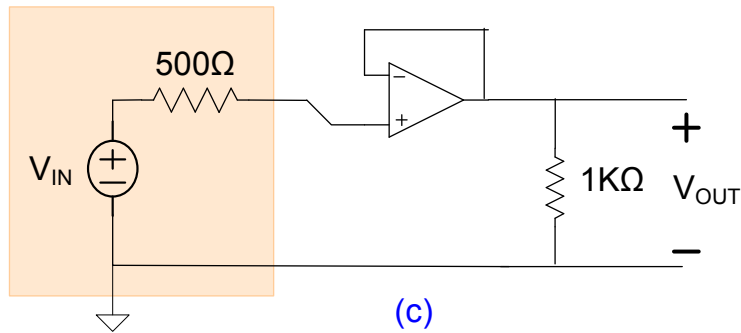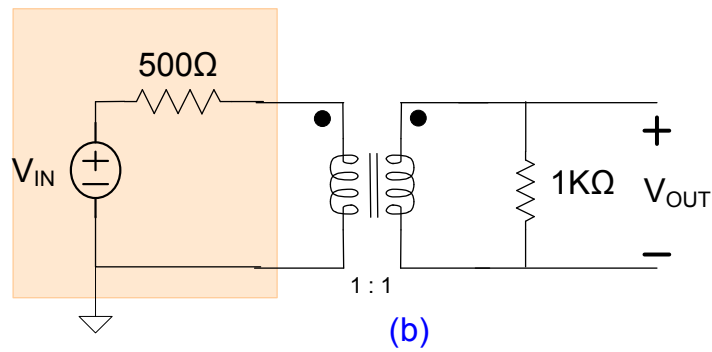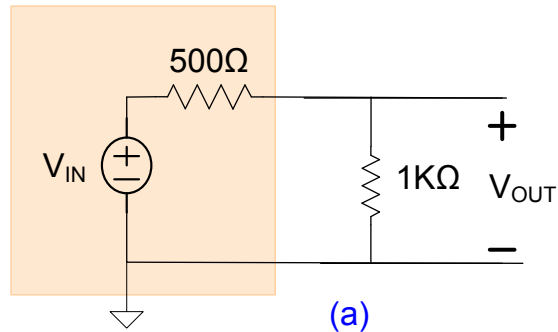
Problem 10   Draw the following two-port as a transconductance amplifier.