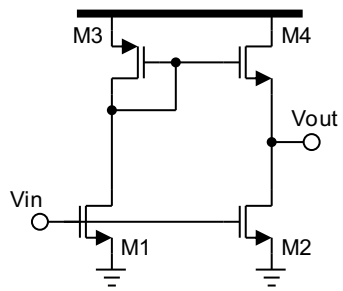


Find the output-referred noise and the input-referred noise.

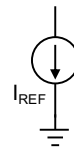
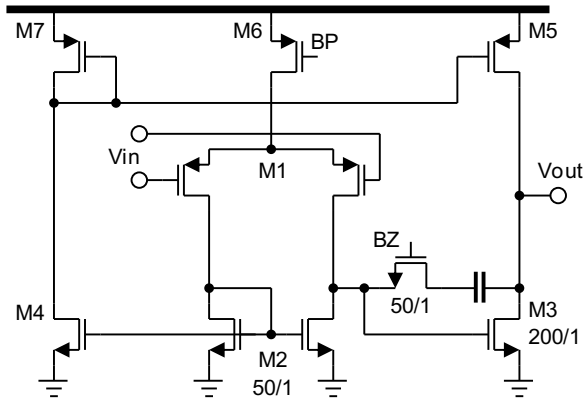


In the amplifier shown below...

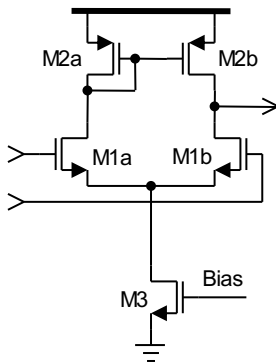
Design the bias BP and specify transistor sizing for zero systematic offset.

Design the bias BZ for right-half-plane zero cancellation.

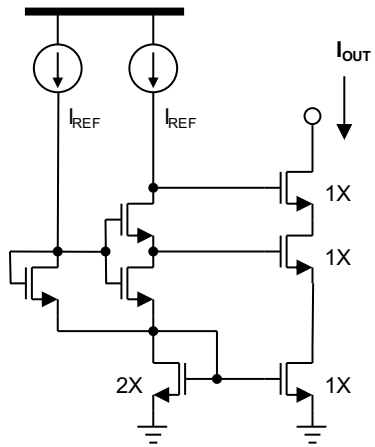
Find the input to output small-signal gain expression.



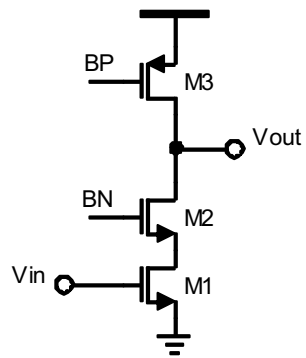
In the circuit shown below, find the output-referred noise. Assume that the circuit is balanced (i.e.  $M1a=M1b$ ,  $M2a=M2b$ ).



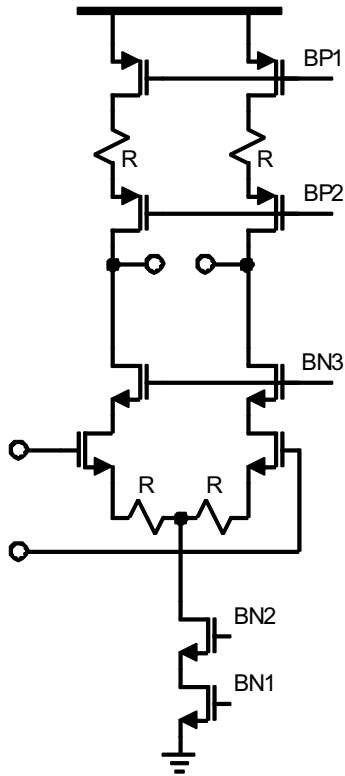
In the current source shown below, appropriately specify the three transistor sizes for optimum biasing.



For the amplifier shown below, find the input-referred noise (expression).



Design optimum bias and CMFB circuits for the amplifier shown below. Use one ideal current source to ground and one ideal CM voltage reference. Specify device sizes as needed – 1X device size is assumed unless specified. Then find the input to output small-signal gain (expression) and CMFB loopgain (expression).



The diagram shows a three-stage current mirror. The first stage consists of NMOS transistors M1 and M2, with a resistor R in the source of M1. The input current  $I_1$  flows into the gate of M1. The output current  $I_2$  flows into the gate of M2. The second stage consists of NMOS transistors M2 and M3, with a resistor R in the source of M2. The input current  $I_2$  flows into the gate of M2. The output current  $I_3$  flows into the gate of M3. The third stage consists of NMOS transistors M3 and M4, with a resistor R in the source of M3. The input current  $I_3$  flows into the gate of M3. The output current  $I_4$  flows into the gate of M4. A current source labeled  $1/4 X$  is connected to the gates of M1 and M2.

Design optimum bias and CMFB circuits for the amplifier shown below. Find the small signal input to output gain (expression) and CMFB loopgain (expression). Specify device sizes as needed. A “1X” device size will be assumed if a device size is not specified.

