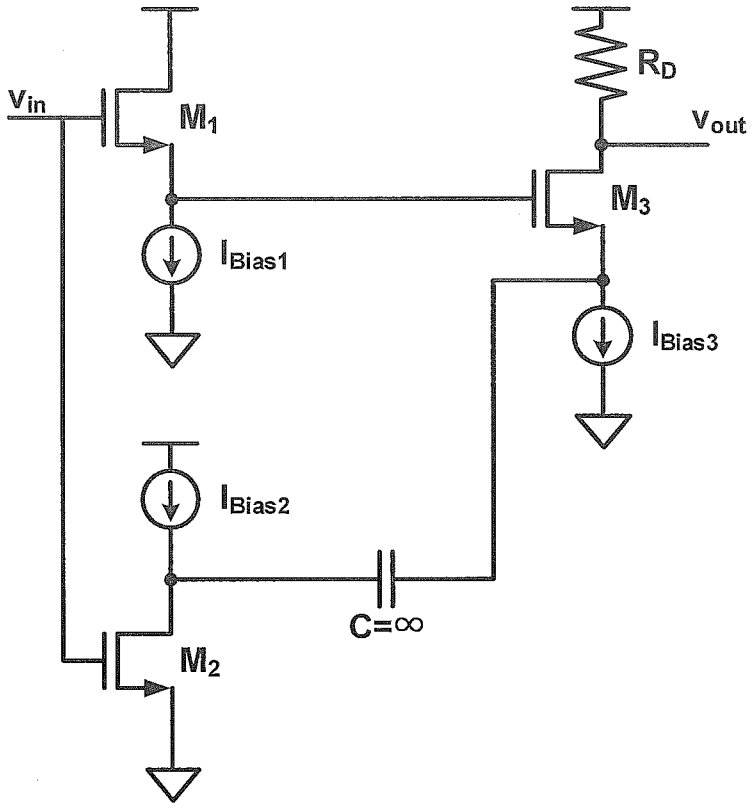
1. [25 points] In the circuit below, find the small signal output voltage v_{out}.
   Assume:
   - All transistors are biased in saturation.
   - The bias current sources are ideal.
   - For all transistors, Cgs = 0, Cgd = 0, Csb = 0, Cdb = 0, and ro = ∞.
   - gm1 = gm2 = gm3 = gm



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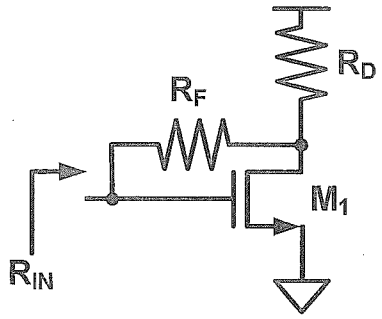
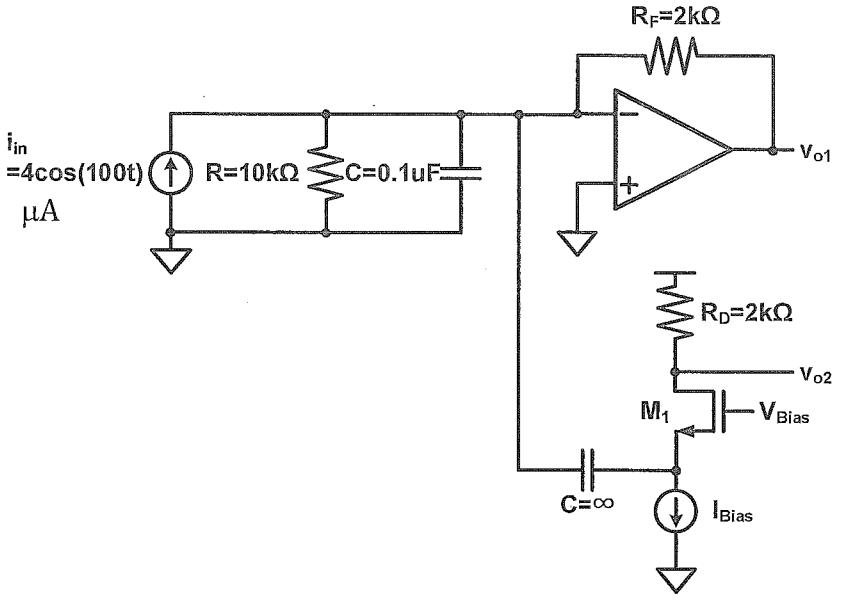
2. [25 points] In the circuit below, find the small signal input resistance R_{IN}.
   Assume:
   - The transistor is biased in saturation.
   - Cgs = 0, Cgd = 0, Csb = 0, Cdb = 0, and ro = ∞.

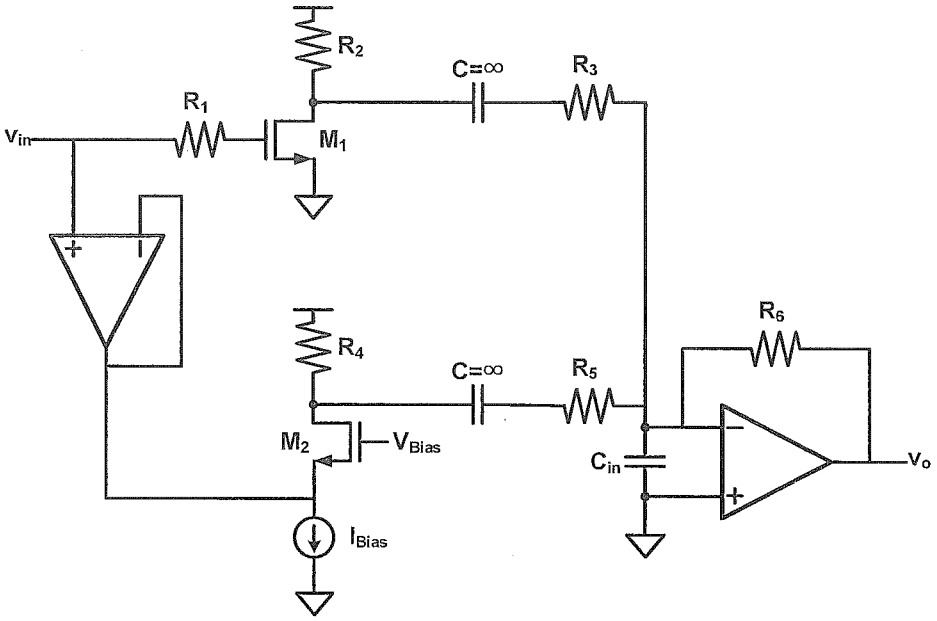


3. [25 points] In the circuit below, find the small signal output voltages v_{out1} and v_{out2}.

   Assume:
   - The transistor is biased in saturation.
   - The op-amp is ideal.
   - The bias current source is ideal.
   - Cgs = 0, Cgd = 0, Csb = 0, Cdb = 0, and ro = ∞.



4. [25 points] In the circuit below, find the transfer function $H(s) = v_{out}/v_{in}$.
   Assume:
   - The op-amps are ideal.
   - All transistors are biased in saturation.
   - The bias current source is ideal.
   - For all transistors, $C_{gs} \neq 0$, $C_{gd} = 0$, $C_{sb} = 0$, $C_{db} = 0$, and $r_o = \infty$.
   - $g_{m1} = g_{m2} = g_m$
   - $R1 = R2 = R3 = R4 = R5 = R6 = R$



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