-Show your work.
-Make approximations to be within 10%.
-Write your answers on this page for 5 points.

Use the following parameters:

- Assume all (W/L)=2, unless otherwise shown in the circuit as
- Kn’=Kp’=10^{-4} A/V^2
- λ_n=λ_p=0.01
- V_f=0.2 V^{1/2}
- 2φ_f=0.6 V
- V_{to,n}=V_{to,p}=0.3 V
- Assume all substrates tied to appropriate supply unless otherwise shown in the circuit.
a) What is $V_{in}$ to set $V_{out}=0$?
a) What is the maximum voltage at Vout if $-1 \leq V_{in} \leq 1$ and all transistors remain in saturation region?

b) Assume V_{in} is set so that V_{out}=0 V, what is the DC power dissipation of this circuit?
3.

a) What is the maximum output voltage, $V_{out}$?

b) If $I_{out} = 10 \mu A$, what is $R_{out}$?
Assume the DC voltage at Vout is 0 V:

a) What is \( Gm = \frac{i_{\text{out}}}{v_{\text{in}}} \bigg|_{V_{\text{out}}=0} \) ?

b) What is Rout?
5.

a) What is $\frac{v_{out}}{v_{in}}$ if $V_{IN} = 0.4\, V$?

b) What is the minimum value of $V_{IN}$ that has all the transistors in saturation?
6.

a) What is the DC voltage at output node, \( v_{\text{out}} \)?

b) What is the gain \( \frac{v_{\text{out}}}{v_1 - v_2} \)?