PROBLEM SET 4: Supplemental Material

1. Though not necessary, it may be useful to consider the of the following approximation from the binomial theorem:

$$I_D(\Delta L) = I_{Dsat}\left(\frac{1}{1-x}\right) \approx I_{Dsat}(1+x)$$

2. To solve this problem you will need an expression for g_m, which I did not give you. Assume that it is given by,

$$g_m = W v_{sat} C_{ox}$$

which is the limit for small L as presented in lecture and as derived in Problem Set #3. You will also need to know that t_{ox}=20nm and x_j=0.3μm. Use all other parameters as given in lecture including the parameters listed in the table below (also use V_a = α = 0.5 because the technology has an n+ gate as described in the problem):

Device	μ_o [cm^2/V-s]	E_o [MV/cm]	ν	v_{sat} (cm/s)
nMOS	670	0.67	1.6	10^7
pMOS	290	0.35	1	$8\text{x}10^6$

Lastly, the W/L values are in microns.

3. Use A_I and B_I as given in lecture. Specifically, A_I = 2x10^{6}cm^{-1} and B_I = 1.7x10^{6}V/cm.

4. Same comment as #3 above.