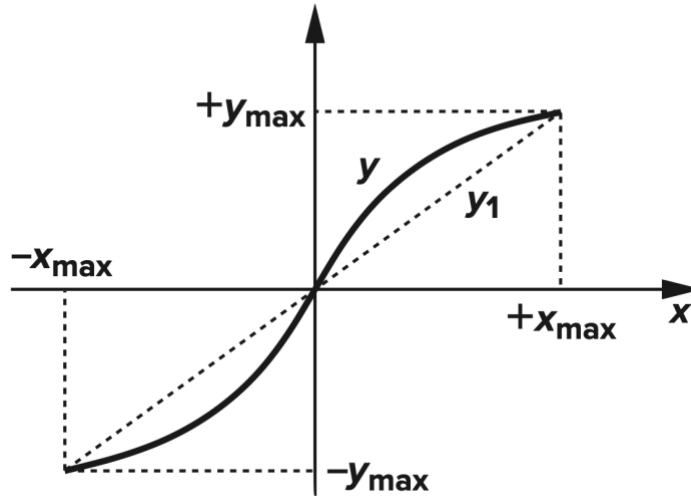


## EE-523 – Exercise 4

1. The input/output characteristic of a differential amplifier is approximated as:  $y(t) = \alpha_1 x(t) + \alpha_3 x^3(t)$ . Calculate the maximum nonlinearity if the input range is from  $x = -x_{\max}$  to  $x = +x_{\max}$ .



2. A common-source stage biased at a current  $I_1$  experiences an input voltage swing that varies the drain current from  $0.75I_1$  to  $1.25I_1$ . Calculate the variation of the small-signal voltage gain: (a) with no degeneration, and (b) with degeneration such that  $gmRS = 2$ , where  $gm$  denotes the transconductance at  $I_D = I_1$ .
3. Calculate the input-referred offset voltage of the circuit shown below. Assume all transistors operate in saturation.

