UNIVERSITY OF CALIFORNIA
College of Engineering
Department of Electrical Engineering
and Computer Sciences

	Homework 8	**EECS 247**
B. E. BOSER	**Due Thursday, November 6, 2003**	**FALL 2003**

In lecture 18 we analyzed the sensitivity of sigma-delta modulators to capacitor nonlinearity. In this homework you are to apply a similar approach to determine amplifier linearity requirements. We will reuse the 2nd order modulator from homework 7. Assume that the circuit shown on slide 3, lecture is used in the first integrator of the modulator. All components are ideal, except for the amplifier transfer characteristic, which for simplicity we model with the following equation:

$$V_o = V_{\max} \tanh\left(A_v V_i\right)$$

Derive a new model for an integrator based on this nonlinear amplifier. Using simulation and $V_{\max} = 2V_{DAC}$ determine the minimum amplifier gain A_v required that results in less than a 3dB increase of the in-band quantization noise and SFDR > 95dB.