## University of Michigan
## EECS 311: Electronic Circuits
Fall 2009

PROBLEM SET 3

Issued 9/23/2009
Due in Lecture 9/30/2009

J&B refers to the course text: "Microelectronic Circuit Design (3rd Edition)," by Richard Jaeger and Travis Blalock.

P3.1 Derive an expression for the input impedance R_{IN} of the non-inverting amplifier below. Assume a non-ideal opamp with finite gain A_0 and input resistance R_{ID}. All other opamp parameters are ideal. Assume that $R_{ID} \gg R_1$, R_2 and use this to simplify your expression.
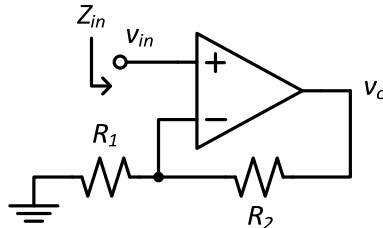
P3.2 Do problems J&B 12.13, part a) only.

P3.3 Do problem J&B 12.27, assume the opamp is ideal and CMRR is due only to resistor tolerance.

P3.4 For the circuit below, assume the opamp is non-ideal with finite gain A_0 and offset voltage V_{OS}. All other opamp parameters are ideal.

a) Derive an expression for v_o/V_{OS}.
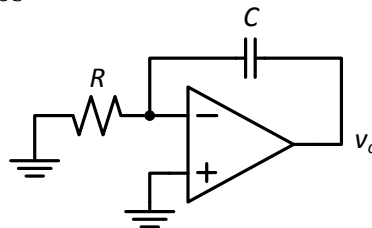
b) Find an expression for the final value of v_o due to the offset voltage. Hint: assume V_{OS} is a step input from 0 to V_{OS} and find the final value of the step response at v_o.

P3.5 Do problem J&B 12.57.

P3.6 Do problem J&B 12.74.

P3.7 Do problem J&B 12.75.