Name: _____

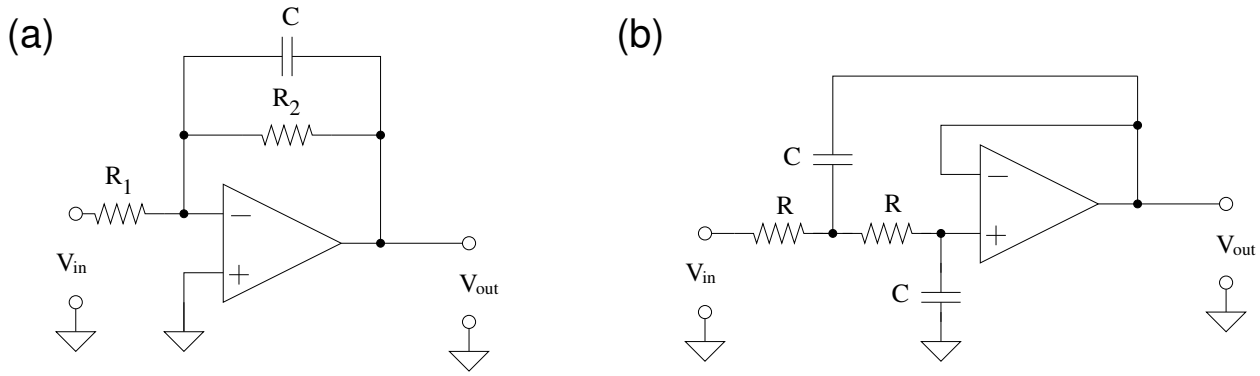

Figure 1: (a) First order active low-pass filter. (b) Sallen-Key second order low-pass filter.

1. Derive Eq. (8) and Eq. (9) in the handout, the equations for the first order low-pass active filters described in the handout for this lab and shown in Fig. 1.

2. Derive an expression for the 3 dB-point (f_{3dB}) for each of the filters described by Eqns. (8) and (9) in terms of their resistances and capacitances.

3. Assume that you have a lot of 0.01μF capacitors. Commercial resistors have values $m \times 10^n\ \Omega$, where n may range from 0 to 6 and available values for m are 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82 and 91. To make a unity-gain first-order low-pass RC active filter with $f_{3dB} = 1600$ Hz, what value resistors should you choose for R_1 and R_2 (Fig. 1a)? To construct a second-order Sallen-and-Key low-pass filter with the same 3 dB-frequency (Fig. 1b), what value R should you choose?