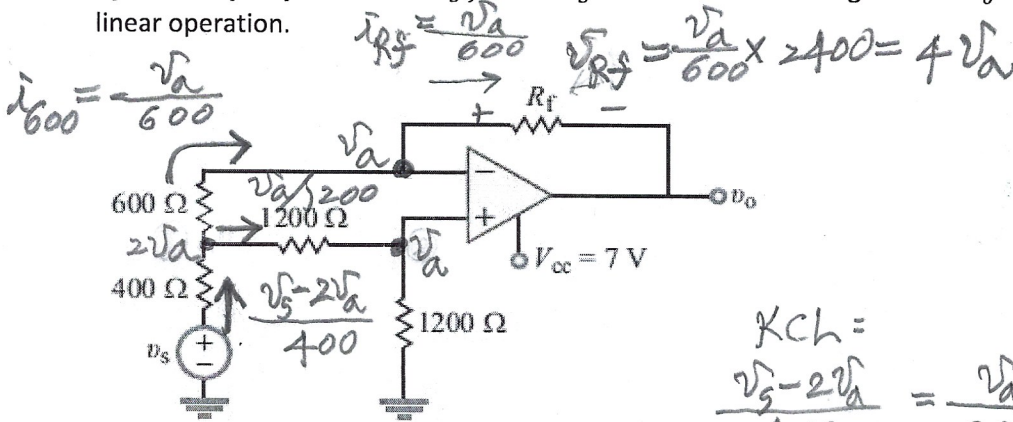


# Solution

EE101\_W19 Quiz 5, Feb. 12, 2019

Name \_\_\_\_\_ Student ID No \_\_\_\_\_

Problem (10 points) For the circuit below, let  $R_f = 2,400 \Omega$ . Specify the voltage range of input signal  $v_s$  which guarantees linear operation of the OP Amp, that is identify A, B such that  $v_o$  is linearly dependent on  $v_s$  for  $A < v_s < B$ . Note that the magnitude of  $v_o$  should not exceed 7 for linear operation.



KCL =

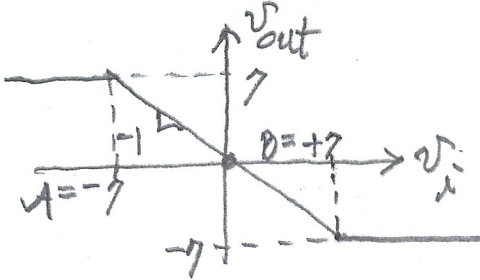
$$\frac{v_s - 2v_a}{400} = \frac{v_a}{600} + \frac{v_a}{1200}$$

Part 1. (6 points) Express  $G = v_o / v_s$ .

$$\begin{aligned} \times 1200 &\Rightarrow 3v_s - 6v_a = 2v_a + v_a \\ 3v_s &= 9v_a \Rightarrow v_a = \frac{1}{3}v_s \\ v_o &= -4v_a + v_a = -3v_a \\ &= -3\left(\frac{1}{3}v_s\right) = -v_s \end{aligned}$$

$$G = \frac{v_o}{v_s} = -1$$

Part 2. (4 points) Specify A and B



$$\begin{aligned} A &= -7 \\ B &= +7 \end{aligned}$$