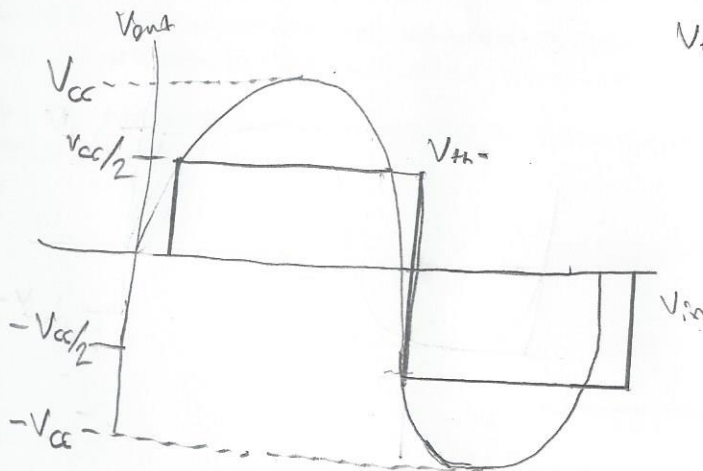


Given this information, let's perform a brief thought experiment. Suppose the input voltage $V_{in}(t)$ is given by $V_{cc}\sin(\omega t)$. In the space provided below, draw the waveform $V_{out}(t)$. Assume that $R_2 = 2R_1$. Label all relevant points in terms of the given variables and briefly explain your reasoning.

Score /5



$$V_{th+} = \frac{R_1}{R_2} V_S$$

$$V_S = V_{cc}$$

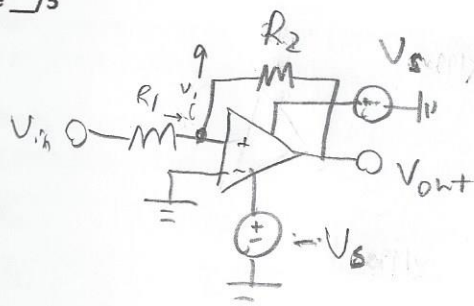
$$V_{th+} = \frac{R_1}{2R_1} V_S = \frac{1}{2} V_{cc}$$

$$V_{th-} = -\frac{R_1}{2R_1} V_{cc}$$

When $V = -V_{cc}/2$,
the thresholds
changes polarity.

Now derive the above equations for V_{th+} and V_{th-} . (Hint: start with the output at V_{cc} or V_{ss} ; what input voltage will make the comparator switch to the other state?)

Score /5



$$V_+ = \frac{R_2}{R_1 + R_2} V_{in} + \frac{R_1}{R_1 + R_2} V_S$$

When $V_+ = 0$
comparator
will switch

$$\frac{-R_1 V_S}{R_1 + R_2} = \frac{R_2}{R_1 + R_2} V_{in}$$

$$V_{in} = -\frac{R_1}{R_2} V_S = V_{th-}$$

$$V_{th-} = \frac{R_2}{R_1 + R_2} V_{in} - \frac{R_1}{R_1 + R_2} V_S$$

$$R_1 V_S = R_2 V_{in}$$

$$V_{in} = \frac{R_1}{R_2} V_S = V_{th+}$$