Week 9 Assignment

1. Horizontal tail volume ratio is defined as
   \[ V_h = \frac{l_t S_t \bar{c}}{S} \]
   \[ V_h = \frac{l_t S_t}{S \bar{c}} \]
   \[ V_h = \frac{l_t S_t}{S \bar{c}} \]
   \[ V_h = \frac{S \bar{c}}{l_t S} \]

2. For the aircraft what is the static margin?
   \[ SM = \bar{X}_{cg} - \bar{X}_{np} \]
   \[ SM = \bar{X}_{ac} - \bar{X}_{cg} \]
   \[ SM = \bar{X}_{cg} - \bar{X}_{ac} \]
   \[ SM = \bar{X}_{np} - \bar{X}_{cg} \]

3. \( C_{m0} \) is given by
   \[ \eta V_h C_{L_{at}} (e_0 + i_w + i_t) \]
   \[ \eta V_h C_{L_{at}} (e_0 + i_w - i_t) \]
   \[ \eta V_h C_{L_{at}} (1 - \frac{d\epsilon}{d\alpha}) \]
   \[ \eta V_h C_{L_{at}} (1 + \frac{d\epsilon}{d\alpha}) \]

4. \( \bar{X}_{np} \) is given by
   \[ \bar{X}_{np} = \bar{X}_{ac} - \frac{C_{m_{af}}}{C_{L_{aw}}} - \eta V_h \frac{C_{L_{at}}}{C_{L_{aw}}} (1 - \frac{d\epsilon}{d\alpha}) \]
   \[ \bar{X}_{np} = \bar{X}_{ac} + \frac{C_{m_{af}}}{C_{L_{aw}}} + \eta V_h \frac{C_{L_{at}}}{C_{L_{aw}}} (1 - \frac{d\epsilon}{d\alpha}) \]
   \[ \bar{X}_{np} = \bar{X}_{ac} - \frac{C_{m_{af}}}{C_{L_{aw}}} + \eta V_h \frac{C_{L_{at}}}{C_{L_{aw}}} (1 + \frac{d\epsilon}{d\alpha}) \]
   \[ \bar{X}_{np} = \bar{X}_{ac} + \frac{C_{m_{af}}}{C_{L_{aw}}} + \eta V_h \frac{C_{L_{at}}}{C_{L_{aw}}} (1 - \frac{d\epsilon}{d\alpha}) \]

5. What will be the value of \( C_{m0} \) at \( C_L = 0 \) for an aircraft flying at \( C_{L_{trim}} = 0.6 \) and static Margin of 10%.
   \[ C_{m0} = 0.03 \]
   \[ C_{m0} = 0.06 \]
   \[ C_{m0} = 0.08 \]
   \[ C_{m0} = 0.13 \]