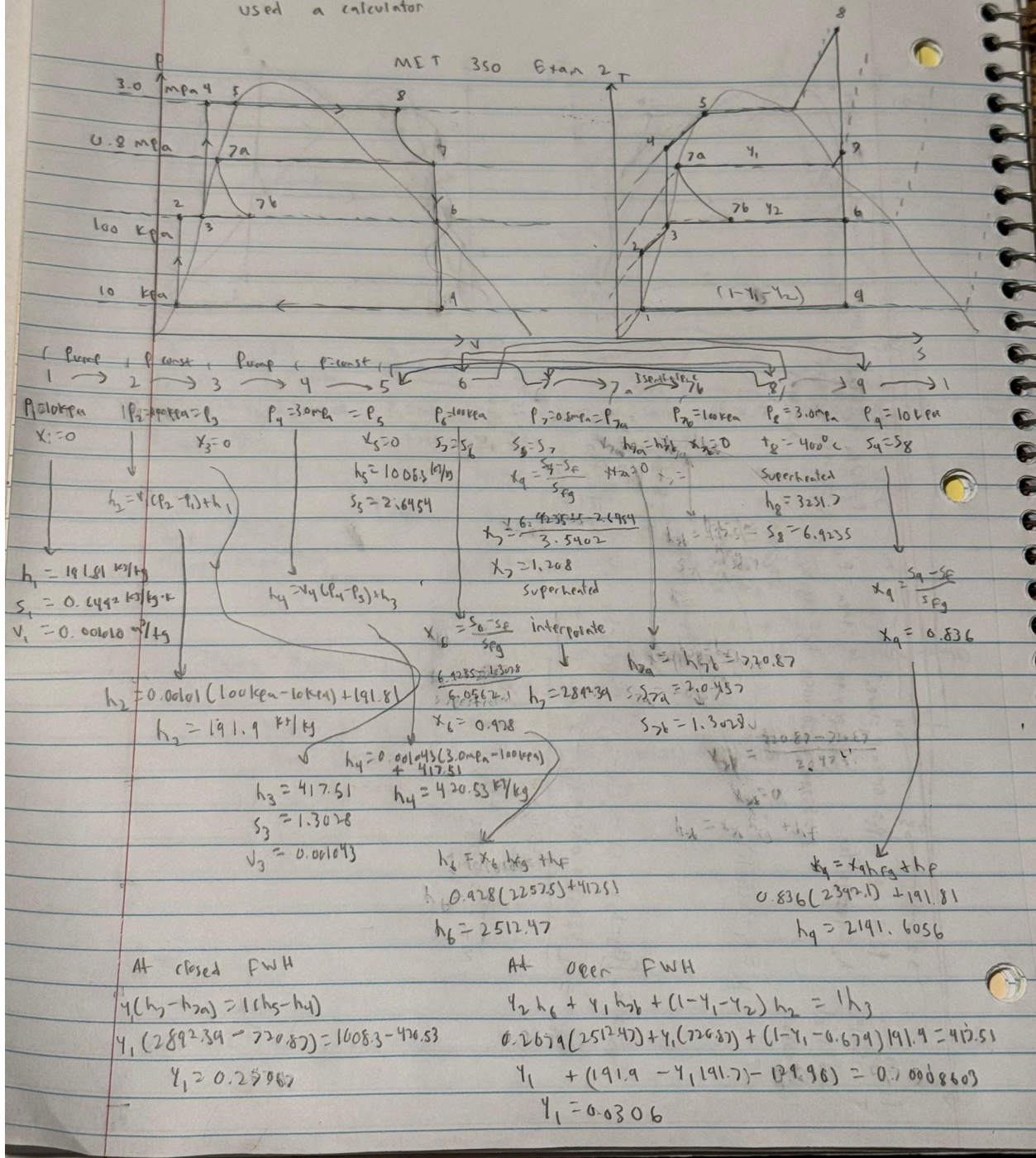


All interpolation & used a calculator



$$w_{\text{Turb,out}} = (h_8 - h_7) + (1 - y_1)(h_7 - h_6) + (1 - y_1 - y_2)(h_6 - h_5)$$

$$(3231.7 - 2892.39) + (1 - 0.0306)(2892.39 - 2512.47) + (1 - 0.0306 - 0.2679)(2512.47 - 2191.61)$$

$$w_{\text{Turb,out}} = 932.687 \text{ kJ/kg}$$

$$w_{\text{pump,in}} = (1 - y_1 - y_2)(h_2 - h_1) + (h_4 - h_3) = 3.0931 \text{ kJ/kg}$$

$$w_{\text{net}} = 935.7701$$

$$q_{\text{in}} = h_8 - h_5 \rightarrow 3231.7 - 1008.3 = 2223.3 \text{ kJ/kg}$$

$$\eta_{\text{th}} = \frac{935.7701}{2223.3} = 0.4203 \text{ or } 42.8\%$$

$y_1 = 0$ The valves stay the same, but must find new mass fraction

$$y_2 h_6 + (1 - y_2) h_2 = h_7$$

$$y_2 (2512.47) + (1 - y_2) 191.9 = 417.51$$

$$y_2 = \frac{191.9 y_2}{191.9 y_2} = 0.0972 = 9.72\%$$

$$w_{\text{Turb,out}} = (h_8 - h_6) + (1 - y_2)(h_6 - h_5)$$

$$(3231.7 - 2512.47) + (1 - 0.0972)(2512.47 - 2191.6056)$$

$$w_{\text{Turb}} = 1008.41 \quad \text{w/pump stays the same}$$

$$w_{\text{pump,in}} = (1 - y_2)(h_2 - h_1) + (h_4 - h_3)$$

$$(1 - 0.0972)(191.9 - 191.81) + (420.53 - 417.51)$$

$$w_{\text{pump,in}} = 3.101$$

$$w_{\text{net}} = 1005.809 \quad q_{\text{in}} \text{ is the same}$$

$$q_{\text{in}} = h_8 - h_5 = 3231.7 - 420.53 = 2811.2$$

$$\eta_{\text{th}} = \frac{1005.809}{2811.2} = 35.8\%$$

Because FWH closed was bypassed, thermal efficiency decreases because it enters boiler at lower temperature