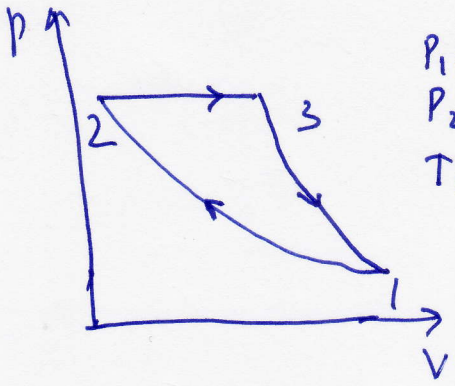
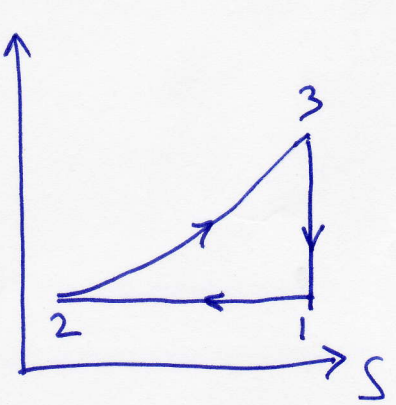
5.4



$P_1 = 100$ kPa
$P_2 = 580$ kPa
$T_1 = 28°C = 301$ K



1-2 Isotermal → $T_2 = T_1$

berlaku $P_1 V_1 = P_2 V_2 \rightarrow PV = C$

$$V_1 = \frac{RT_1}{P_1} = \frac{0{,}287 \cdot 301}{100} = 0{,}864 \ m^3/kg$$

$$V_2 = \frac{100 \cdot 0{,}864}{500} = 0{,}149 \ m^3/kg$$

2-3 Isobar → $P_3 = P_2 = 580$ kPa

3-1 Isentropik

berlaku $\frac{T}{P^{\frac{(k-1)}{k}}} = C$

$$\frac{T_3}{P_3^{(\frac{0{,}4}{1{,}4})}} = \frac{T_1}{P_1^{(\frac{0{,}4}{1{,}4})}} \rightarrow T_3 = T_1 \left(\frac{P_3}{P_1}\right)^{0{,}286}$$

$$= 301 \left(\frac{580}{100}\right)^{0{,}286}$$

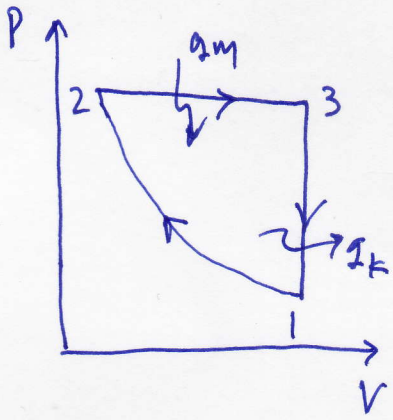
$$= 497{,}6 \ K$$

V_3 bisa dicari dari $PV^k = C$

$$\eta_{th} = 1 - \left(\frac{T_2}{T_3}\right) \rightarrow \eta_{th} = 1 - \left(\frac{301}{497{,}6}\right) \times 100\%$$

$$= 60{,}5\%$$

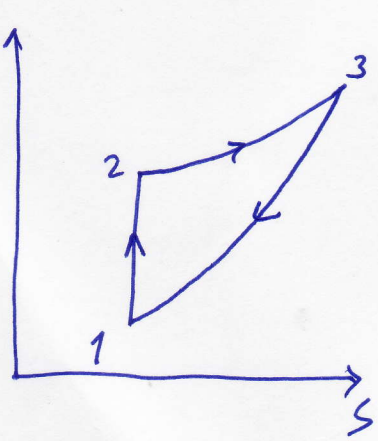
5.5



$P_1 = 100$ kPa

$T_1 = 33°C = 306$ K

$P_2 = 750$ kPa



1-2 isentropik berlaku $\frac{T}{P^{\left(\frac{k-1}{k}\right)}} = C$

$$\frac{T_2}{P_2^{\left(\frac{k-1}{k}\right)}} = \frac{T_1}{P_1^{\left(\frac{k-1}{k}\right)}} \rightarrow T_2 = T_1 \left(\frac{P_2}{P_1}\right)^{0,286}$$

$$= 306 \left(\frac{750}{100}\right)^{0,286}$$

$$= 544,5 \text{ K}$$

$V_1 = \frac{RT_1}{P_1}$ → didapat

V_2 bisa dicari dari $PV^k = C$

2-3 isobar → $P_2 = P_3 = 750$ kPa

3-1 isochorik berlaku $V = C \rightarrow \frac{T_1}{P_1} = \frac{T_3}{P_3} \rightarrow V_3 = V_1$

$$T_3 = T_1 \frac{P_3}{P_1}$$

$$= 306 \cdot \frac{750}{100}$$

$$= 2295 \text{ K}$$

$q_m = C_p (T_3 - T_2)$

$q_k = C_v (T_3 - T_1)$

$C_p = 1,0035$

$C_v = 0,7165$

$$\eta_{th} = 1 - \frac{q_k}{q_m}$$

$$= 1 - \frac{1,0035\,(2295 - 544,5)}{0,7165\,(2295 - 306)} \times 100\% = 23,3\%$$