注意事項：

1. 本試題共 4 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1, For an ideal polymeric rubber, $dE=TdS- PdV+ fdL$.

   f is the stretching force with a small deformation dL.

   Under constant volume and temperature,

   Prove $f=-T(dS/dL)$ (25%)

2. A steel casting [$Cp=0.12(BTU)/(lbm)(^0F)$] weighing 75(lbm) and having

   a temperature of $800^0(F)$ is　　　quenched　　in 300(lbm)

   of oil[$Cp=0.6(BTU)/(lbm)(^0F)$], If there are no heat losses, what

   is the changes of the entropy of the total system.(25%)

3, Prove the following;

   (1), $(dT/dV)s=-(dP/dS)v$　　　(9%)

   (2), Clapeyron equation　　　(8%)

   (3), Gibbs-Duhem equation(for constant T and P).　(8%)

4,(1), What is the meaning of fugacity and activity coefficient ?(9%)

   (2), Explain the second law of thermodynamics. (8%)

   (3), From $S=k \ln Q$,

   S is the entropy and Q is the thermodynamic probability.

   What is the value of Q at zero absolute temperature for a

   perfect crystal.(8%)