Problem 4

```
T1 = 310;
T2 = 670;
Tb = 300;
h = @(T) 300 + 2.5*T + 0.0007*T.^2;
s = @(T) 2.0*log(T) + 0.001*T;
h1 = h(T1);
h2 = h(T2);
delta_h = h2 - h1;
s1 = s(T1);
s2 = s(T2);
delta_s = s2 - s1;
Qdot = linspace(20,100,400);
mdot = linspace(0.01,5,400);
[QDOT, MDOT] = meshgrid(Qdot, mdot);
Qdot_energy = MDOT .* delta_h;
Sgen = MDOT .* delta_s - QDOT ./ Tb;
energy_condition = abs(QDOT - Qdot_energy) < 0.5;
entropy_condition = Sgen >= 0;
feasible = energy_condition & entropy_condition;
figure;
scatter(QDOT(feasible), MDOT(feasible), 12, 'b', 'filled')
xlabel('Heat Input')
ylabel('Mass Flow Rate')
title('Feasible Operating Region')
grid on
hold on
mdot_boundary = Qdot ./ (Tb * delta_s);
plot(Qdot, mdot_boundary, 'r', 'LineWidth', 2)
legend('Feasible Points')
fprintf('Delta h = %.2f kJ/kg\n', delta_h);
fprintf('Delta s = %.4f kJ/kg-K\n', delta_s);
figure;
plot(Qdot, mdot_boundary, 'k', 'LineWidth', 2)
xlabel('Heat Input')
ylabel('Minimum')
```

```
title('Second Law Constraint')
grid on
```