Hints on Problem 9.4

1) Assume an R value of 20 for the equal percentage valve in order to simplify grading (i.e., it matches the answer key).

2) For each nominal condition, the problem states that $f(\ell)$ is 0.5. This means that ℓ is 0.5 for the linear case but not for the equal percentage valve case.

3) The total pressure drop for the entire system is constant for a given case, but not the same for cases a, b, and c. In each case the total pressure drop can be calculated by adding the pressure drop across the condenser at 200 gal/min (30 psi for all three cases) to the specified pressure drop across the valve at that same flow rate ($\Delta p_{tot} = \Delta p_{valve} + \Delta p_{ccondenser}$). In other words, Δp_{tot} = 35 psi for case a, but 60 psi for case b, etc.

4) The pressure drop across the valve will change with flow rate. Assume that the only appreciable pressure drops in the system are across the valve and condenser.

5) You will need to calculate a different value for C_v for each case based on the information provided in the problem statement. K stays constant for the entire problem (Why?). Also, since K and C_v are independent of flow rate, you will want to calculate them from at the "nominal" condition of 200 gal/min. (where $\Delta p_c = K q^2$).

6) Your final equation should only have q and l as variables, without any Δp_v or Δp_c terms.