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## Problem Set 10

### Problem 6.1

- (a) Starting with the definition of the Helmholtz energy in Equation 6.3, derive the fundamental property relation in Equation 6.10
- (b) Starting with the definition of the Gibbs energy in Equation 6.4, derive the fundamental property relation in Equation 6.11.

### Problem 6.4

- (a) Starting with the fundamental property relation Equation 6.10, derive the Maxwell relation given in Equation 6.16.
- (b) Starting with the fundamental property relation Equation 6.9, derive the Maxwell relation given in Equation 6.15.

### Problem 6.141

Calculate  $Z$ ,  $H^R$ , and  $S^R$  by the Redlich-Kwong equation for the following:

- (a) Ethylene at 500 K and 35 bar.
- (b) Hydrogen sulfide at 400 K and 70 bar.
- (c) Nitrogen at 150 K and 50 bar.
- (d) n-Octane at 575 K and 15 bar.
- (e) Propane at 375 K and 25 bar.