

MEL 7401 ADVANCED THERMODYNAMICS

Pfaffian Mathematical Models for Thermodynamics

Problem 1: The p - v - T relation for Clausius gas is

$$\left(p + \frac{a}{v^2}\right)(v - b) = RT$$

Where a , b and R are constants. Show that T is a property of gas.

Problem 2: Integrate

$$(x^2 + y)dx + 3xydy$$

Along the paths **(a)** The straight line $y = mx$ and **(b)** $y = x^2$. Are the results of (a) and (b) equal? Discuss the nature of differential.

Problem 3: Integrate

$$(x^2 + y^2)dx + 2xydy$$

Along the paths **(a)** The straight line $y = x$ and **(b)** $y = x^3$. Why in this case, the answer for the two paths are identical.

Problem 4: Find the total differential of T using the equation

$$\left(p + \frac{a}{v^2}\right)(v - b) = RT$$

and integrate the differential along **(a)** $p = p_0 + k/v$, **(b)** $p v^2 = C_1$ and **(c)** $p v^{1.4} = C_2$ and prove that the change in T is independent of path of integration.