Thermodynamics

learning note For reading translation

我真的不懂忧郁

Delft University of Technology

TU Delft

Thermodynamics

learning note For reading translation

by

我真的不懂忧郁

Student Name	Student Number
First Surname	1234567

Instructor:	I. Surname
Teaching Assistant:	I. Surname
Project Duration:	Month, Year - Month, Year
Faculty:	Faculty of Aerospace Engineering, Delft

Style: TU Delft Report Style, with modifications by Daan Zwaneveld

TU Delft

Preface

A preface...

我真的不懂忧郁

Delft, October 2024

Summary

A summary...

目录

Nomenclature

If a nomenclature is required, a simple template can be found below for convenience. Feel free to use, adapt or completely remove.

Abbreviations

Abbreviation	Definition
ISA	International Standard Atmosphere
...	

Symbols

Symbol	Definition	Unit
V	Velocity	[m/s]
...		
ρ	Density	[kg/m^3]
...		

Chapter 1

王竹溪. chapter1

Question 1 (p24,2): f,g,h 都是二独立变量 x,y 的函数[1]

(1) $(\partial f/\partial g)_h = 1/(\partial g/\partial f)_h$;

(2) $(\partial f/\partial g)_x = (\partial f/\partial y)/(\partial g/\partial y)$;

(3) $(\partial y/\partial x)_f = -(\partial f/\partial x)/(\partial f/\partial y)$;

(4) $(\partial f/\partial g)_h(\partial g/\partial h)_f(\partial h/\partial f)_g = -1$;

(5) $(\partial f/\partial x)_g = (\partial f/\partial x) + (\partial f/\partial y)(\partial y/\partial x)$;

proof: .

(1) 根据隐函数求导链式法则

$$\frac{\partial f}{\partial g}\cdot\frac{\partial g}{\partial f} = \frac{\partial f}{\partial f} = 1 \tag{1.1}$$

(2) 根据隐函数求导链式法则和反函数定理

$$\frac{\partial f}{\partial g} = \frac{\partial f}{\partial y}\cdot\frac{\partial y}{\partial g} = \frac{\partial f}{\partial y}\Big/\frac{\partial g}{\partial y} \tag{1.2}$$

(3)

(4)

(5)

Question 2 (p24,3): f,g,h,k 都是二独立变量 x,y 的函数，且

$$\frac{\partial(f,g)}{\partial(x,y)} = \begin{vmatrix} \frac{\partial f}{\partial x} & \frac{\partial f}{\partial y} \\ \frac{\partial g}{\partial x} & \frac{\partial g}{\partial y} \end{vmatrix} = \frac{\partial f}{\partial x}\frac{\partial g}{\partial y} - \frac{\partial f}{\partial y}\frac{\partial g}{\partial x} \tag{1.3}$$

证明

[1] $(\frac{\partial f}{\partial g})_h$ 为保持 h 不变求 f 对 g 的偏导

(1) $\partial(f,g)/\partial(h,k)=[\partial(f,g)/\partial(x,y)]/[\partial(h,k)/\partial(x,y)]$;

(2) $\partial(f,g)/\partial(x,y)=1/(\partial(x,y)/\partial(f,g))$;

(3) $(\partial f/\partial g)_h=\partial(f,h)/\partial(g,h)$;

(4) $(\partial f/\partial g)_h=(\partial(f,h)/\partial(x,y))/(\partial(g,h)/\partial(x,y))$;

(5) $(\partial f/\partial x)_g=(\partial(f,g)/\partial(x,y))/(\partial g/\partial y)$

***proof*:**

上述结论可以推广到任意 n 个独立变量的函数上。

Question 3 (p25,6)**:** 证明理想气体的膨胀系数、压强系数以及压缩系数各为 $\alpha=\beta=1/T,\kappa=1/\rho$

***proof*:**

Question 4 (p25,7)**:** 证明任何一个二独立变量 ∂,p 的物体，其物态方程可以通过实验观测的膨胀系数 α 和压缩系数 κ 根据下列积分得到

$$\ln V=\int(\alpha d\partial-\kappa dp) \tag{1.4}$$

应用这个公式到理想气体，把积分求出，选 T 为温标，并假设 $\alpha=1/T,\kappa=1/p$

***proof*:**

Question 5 (p25,8)**:** 假如某一测温物质的定压温度计的温标等于定容温度计的温标，证明这一物质的物态方程为

$$\partial=\alpha(p+a)(V+b)+c \tag{1.5}$$

其中 α,a,b,c 都是常数，∂ 为这一物质的定压温度计和定容温度计所测量的共同的温度，

***proof*:**

References

[1] I. Surname, I. Surname, and I. Surname. “The Title of the Article”. In: *The Title of the Journal* 1.2 (2000), pp. 123–456.

Chapter A

Source Code Example

Adding source code to your report/thesis is supported with the package `listings`. *An example can be found below. Files can be added using* `\lstinputlisting[language=<language>]{<filename>}`.

```
"""
ISA Calculator: import the function, specify the height and it will return a
list in the following format: [Temperature,Density,Pressure,Speed of Sound].
Note that there is no check to see if the maximum altitude is reached.
"""

import math
g0 = 9.80665
R = 287.0
layer1 = [0, 288.15, 101325.0]
alt = [0,11000,20000,32000,47000,51000,71000,86000]
a = [-.0065,0,.0010,.0028,0,-.0028,-.0020]

def atmosphere(h):
    for i in range(0,len(alt)-1):
        if h >= alt[i]:
            layer0 = layer1[:]
            layer1[0] = min(h,alt[i+1])
            if a[i] != 0:
                layer1[1] = layer0[1] + a[i]*(layer1[0]-layer0[0])
                layer1[2] = layer0[2] * (layer1[1]/layer0[1])**(-g0/(a[i]*R))
            else:
                layer1[2] = layer0[2]*math.exp((-g0/(R*layer1[1]))*(layer1[0]-layer0[0]))
    return [layer1[1],layer1[2]/(R*layer1[1]),layer1[2],math.sqrt(1.4*R*layer1[1])]
```

Chapter B

Task Division Example

If a task division is required, a simple template can be found below for convenience. Feel free to use, adapt or completely remove.

表 B.1: Distribution of the workload

	Task	Student Name(s)
	Summary	
Chapter 1	Introduction	
Chapter 2		
Chapter 3		
Chapter *		
Chapter *	Conclusion	
	Editors	
	CAD and Figures	
	Document Design and Layout	