

1. Introduction and Review

1.1. Introduction

1.2. Review of Thermodynamics

1.3. Stagnation Properties

1.4. Equations of Fluid Dynamics

1.4.1. Conservation of Mass – Continuity

1.4.2. Conservation of Momentum for Inviscid Flows

1.5. Speed of Sound and Mach Waves

HW #1

2. 1-D Isentropic Flows

2.1. 1-D Duct Flow

2.2. Nozzle Flows

2.2.1. Converging Nozzle

2.2.2. Converging – Diverging Nozzle

HW #2

3. Normal Shock Waves

3.1. Introduction

3.2. Governing Equations

3.3. Rankine – Hugoniot Relations

3.4. Converging-Diverging Nozzles

HW #3

3.5. Diffusers and Inlets

3.6. Moving Shock Waves

HW #4

4. Adiabatic Flow with Friction (Fanno Flow)

4.1. Governing Equations

4.2. Fanno Lines

5. Frictionless Flow with Heat Transfer (Rayleigh Flow)

5.1. Governing Equations

5.2. Rayleigh Lines

5.3. Generalized 1-D Flow

6. 2-D Shock Waves

6.1. Governing Equations

6.2. Prandtl-Meyer Flow

7. Computational Fluid Dynamics

7.1. Introduction

7.2. Finite-Difference Methods

7.2.1. Explicit Methods

7.2.2. Implicit Methods

7.3. Applications to Compressible Flow

7.3.1. 1-D Nozzle Flow

7.3.2. Prandtl-Meyer Expansion Wave