MAE 158
Recommended Homework 1

From Shevell, *Fundamentals of Flight*
Problems 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 5.2

Chapter 3:

PROBLEMS

3.1. The gross weight of a two-place Piper Cherokee is 2000 lb and its wing area is 160 ft^2. What is its wing loading?

3.2. A Boeing 747B has a wing loading of 123 lb/ft^2 at takeoff and a wing area of 5500 ft^2. What is its takeoff weight?

3.3. A 747 with a gross (total) weight of 650,000 lb is cruising at 35,000 ft at a speed of 465 knots. The 747 has a wing area of 5500 ft^2. The density at 35,000 ft is 0.0007382 $slug/ft^3$. What is the value of the cruise lift coefficient, C_L, and the wing loading? (When using equations 3.9, V must be in feet per second in the English system.)

3.4. If the 747 in Problem 3.3 has a drag of 40,000 lb, what is the drag coefficient?

3.5. A DC-9 is carrying 100 passengers at 30,000 ft at a C_L of 0.35. The density at 30,000 ft is 0.0008907 $slug/ft^3$. The DC-9 wing area is 1000 ft^2 and its weight is 100,000 lb. What is the cruise speed in feet per second? in miles per hour? in knots?

3.6. A Cessna 150 is cruising at 115 mph at 7000 ft. The airplane weighs 1500 lb and has a wing area of 157 ft^2. What is the lift coefficient? If the drag coefficient is 0.0300, what is the drag in pounds? The air density, ρ, at 7000 ft is 0.001927 $slug/ft^3$.

Chapter 5:

5.2. Calculate the values of pressure, pressure ratio, density, density ratio, and temperature for the standard atmosphere at geometric altitudes of 5000, 10,000, 11,019, and 15,000 m. Show results in SI units. The sea-level values are pressure = 1.01325×10^5 N/m^2, density = 1.2250 kg/m^3, and temperature = 288.16 K. The temperature lapse rate $a = -0.0065$ K/m; above 11,019 m, $a = 0$.

For Reference,
You may utilize Appendix A, Characteristics of the standard atmosphere from Shevell, located in the Canvas page *files* tab.

For Reference,
Figure 5.2, Temperature variation with altitude in the U.S. standard atmosphere from Shevell:

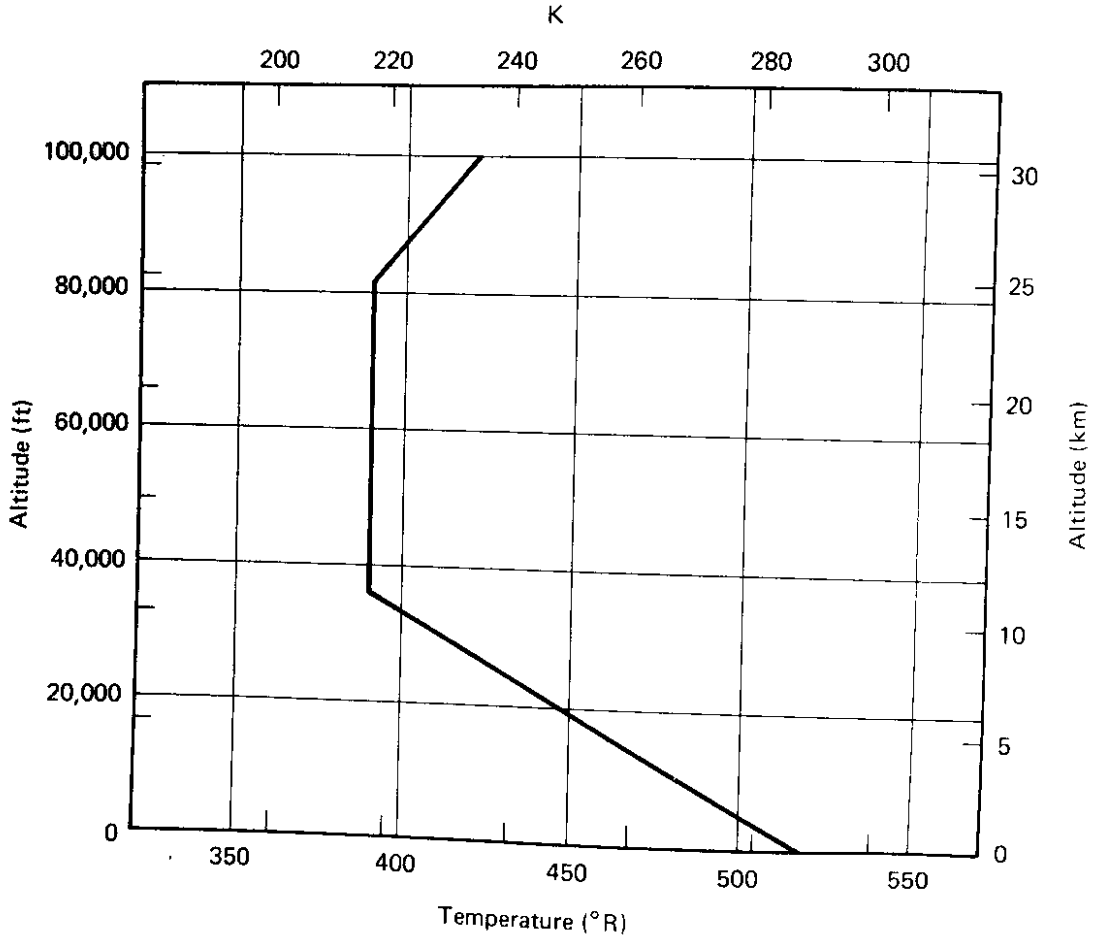

Figure 5.2 Temperature variation with altitude in the U.S. standard atmosphere.