ME 1020 Engineering Programming with MATLAB

Problem 1.12:

12. The *ideal gas law* relates the pressure P, volume V, absolute temperature T, and amount of gas n. The law is

$$P = \frac{nRT}{V}$$

where R is the gas constant.

An engineer must design a large natural gas storage tank to be expandable to maintain the pressure constant at 2.2 atm. In December when the temperature is 4°F (−15°C), the volume of gas in the tank is 28 500 ft^3. What will the volume of the same quantity of gas be in July when the temperature is 88°F (31°C)? (*Hint*: Use the fact that n, R, and P are constant in this problem. Note also that K = °C + 273.2.)

Problem Setup:

$$P = \frac{nRT}{V}$$

$$n, R, P = \text{Constant}$$

$$\frac{T}{V} = \frac{P}{nR} = \text{Constant}$$

$$\frac{T_1}{V_1} = \frac{T_2}{V_2}$$

$$\frac{T_{\text{Dec}}}{V_{\text{Dec}}} = \frac{T_{\text{July}}}{V_{\text{July}}}$$

$$V_{\text{July}} = V_{\text{Dec}}\left(\frac{T_{\text{July}}}{T_{\text{Dec}}}\right)$$

```
%Prob. 1-12: Scott Thomas
clear
clc
disp('Problem 1.12: Scott Thomas')
v_dec=28500
t_dec=-15+273
t_july=31+273
v_july=v_dec*t_july/t_dec
```

```
Problem 1.12: Scott Thomas

v_dec =

       28500


t_dec =
```

```
   258

t_july =

   304

v_july =

   3.3581e+04
```