Problem #2

Given

- NACA 2412
- Air pressure = P = 1.01E+05 Pa
- Temperature = 30C
- Free stream velocity = V = 45 m/s

Solution

Setup

```
Pres = 1.01*10^5; % [Pa]
Temp = 30; % [C]
Vel = 45; % [m/s]
Chord = 1; % [m]
R_air = 287.05; % [J/KgK] gas constant of air
Visc = 1.789 * 10^(-5); % [Pa-s]

% At this temperature from equation of state
% density
rho = Pres / R_air / (Temp + 273.15);

% The Reynold's # becomes
Re = rho * Vel * Chord / Visc;
```

Re = 2.9195E+06

Tabulated Data

```
% With the Reynold's number and Anderson's table
alpha = [-8 -4 0 4 8]; % Angle of attacks [degree]
l_coeff = [-0.6 -0.18 0.25 0.65 1.08]; % lift coefficients
d_coeff = [0.009 0.0072 0.0054 0.0067 0.011]; % drag coefficients
```

Because

$$\frac{L}{D} = \frac{C_L}{C_D}$$

```
L_D = l_coeff ./ d_coeff; % lift drag ratio
```

Plot

```
figure(1)
plot(alpha, L_D, "-or")
title('Lift to Drag Ratio of NACA 2412')
xlabel('Angle of Attack [deg]')
ylabel('Lift to Drag Ratio')
```