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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ASEN 3111 - CA3
%
% Created By: Johnathan Tucker
%
% Collaborators: Michael Martinson
%
% The purpose of the script is to act as a driver that will execute
the
% functions necessary to solve questions two and three of CA3. Note
that
% question one is the function Vortex_Panel itself.
%
% Created Date: 3/25/2020
%
% Change Log:
%       - 3/26/2020: Code up the function for the first question
%       - 3/28/2020: Code up the function for the second question
%       - 3/31/2020: Finalize formatting
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

## Housekeeping

```
clc;
clear all;
close all;
tic
```

## Question 1

For my solution to question 1 please see my Vortex\_Panel function

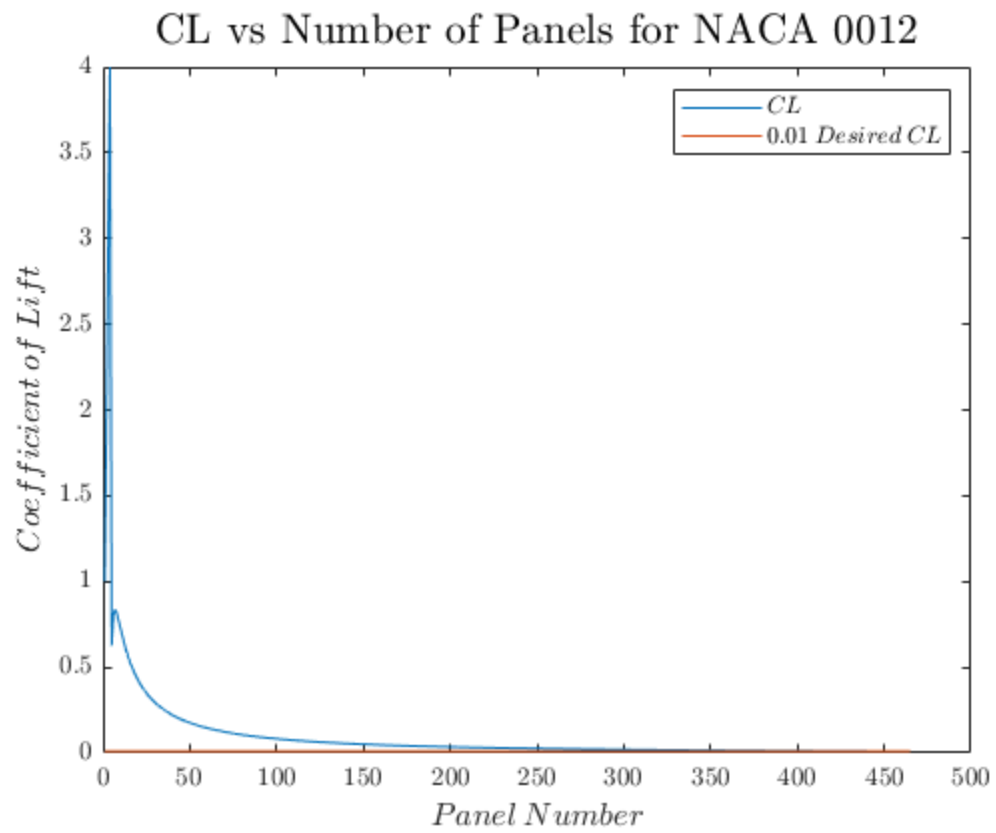
## Question 2

```
Question_2()
```

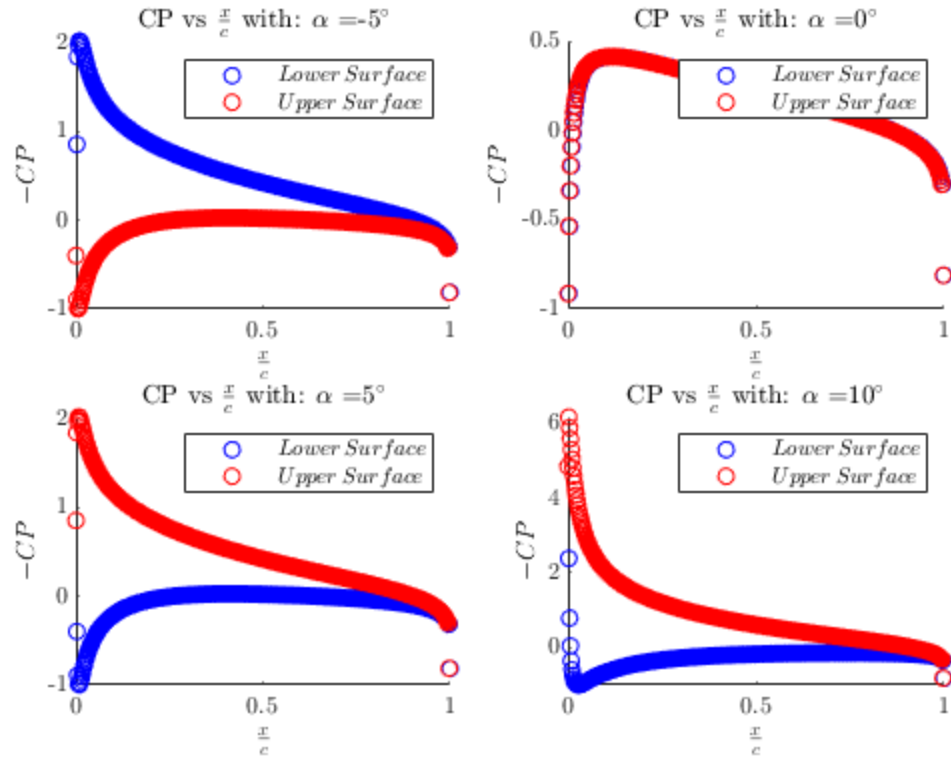
*The number of panels required to obtain 0.01 absolute error...*

---

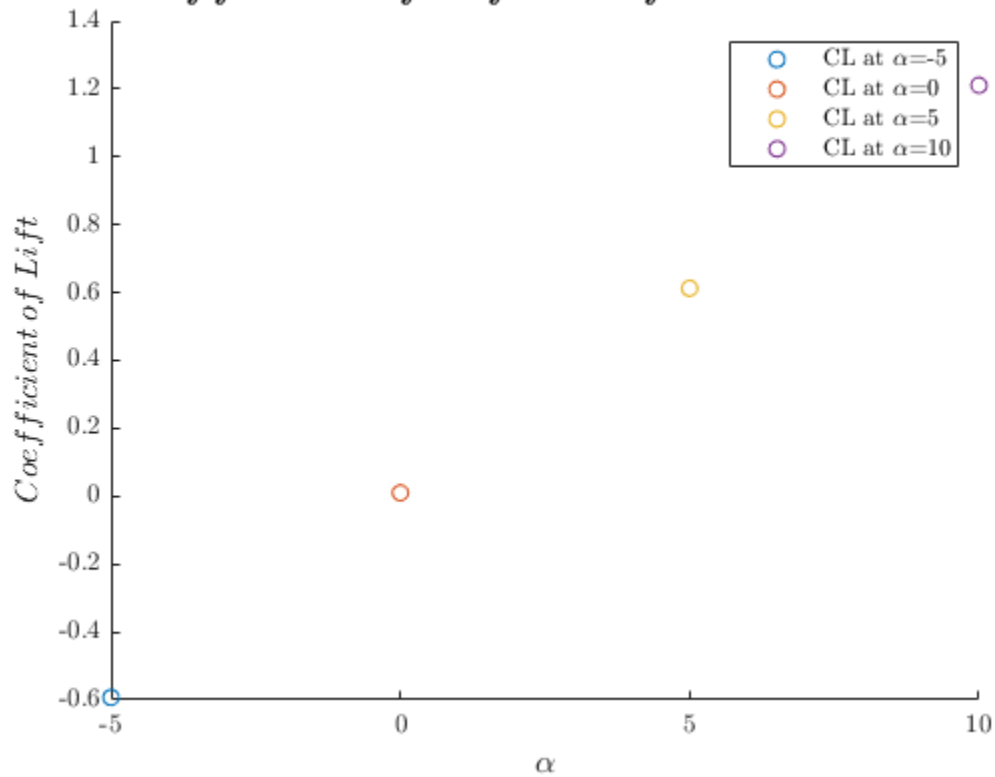
when compared to the exact value is 465.000000



### CP vs $\frac{x}{c}$ at Different $\alpha$ Values



### Coefficient of Lift vs $\alpha$ for NACA 0012



---

## Question 3

Question\_3()

%% NACA 0012 %%%  
%%%%%%%%

Results for the NACA 0012 Airfoil:

Vortex Panel Estimated Lift Curve Slope: 6.888181 [1/rad]

Thin Airfoil Theory Estimated Lift Curve Slope: 6.283185 [1/rad]

Percent Error of Lift Curve Slope Estimates: 8.783093 %

Vortex Panel Estimated Zero Lift AOA: 0.417718 [deg]

Thin Airfoil Theory Estimated Zero Lift AOA: -0.000000 [deg]

Absolute Error of Zero Lift AOA Estimates: 0.417718

%% NACA 2412 %%%  
%%%%%%%%

Results for the NACA 2412 Airfoil:

Vortex Panel Estimated Lift Curve Slope: 6.890932 [1/rad]

Thin Airfoil Theory Estimated Lift Curve Slope: 6.283185 [1/rad]

Percent Error of Lift Curve Slope Estimates: 8.819509 %

Vortex Panel Estimated Zero Lift AOA: -1.727840 [deg]

Thin Airfoil Theory Estimated Zero Lift AOA: -1.512579 [deg]

Absolute Error of Zero Lift AOA Estimates: 0.215261

%% NACA 4412 %%%  
%%%%%%%%

Results for the NACA 4412 Airfoil:

Vortex Panel Estimated Lift Curve Slope: 6.894439 [1/rad]

Thin Airfoil Theory Estimated Lift Curve Slope: 6.283185 [1/rad]

Percent Error of Lift Curve Slope Estimates: 8.865899 %

Vortex Panel Estimated Zero Lift AOA: -3.857460 [deg]

Thin Airfoil Theory Estimated Zero Lift AOA: -3.025159 [deg]

Absolute Error of Zero Lift AOA Estimates: 0.832301

%% NACA 2424 %%%  
%%%%%%%%

Results for the NACA 2424 Airfoil:

Vortex Panel Estimated Lift Curve Slope: 7.549962 [1/rad]

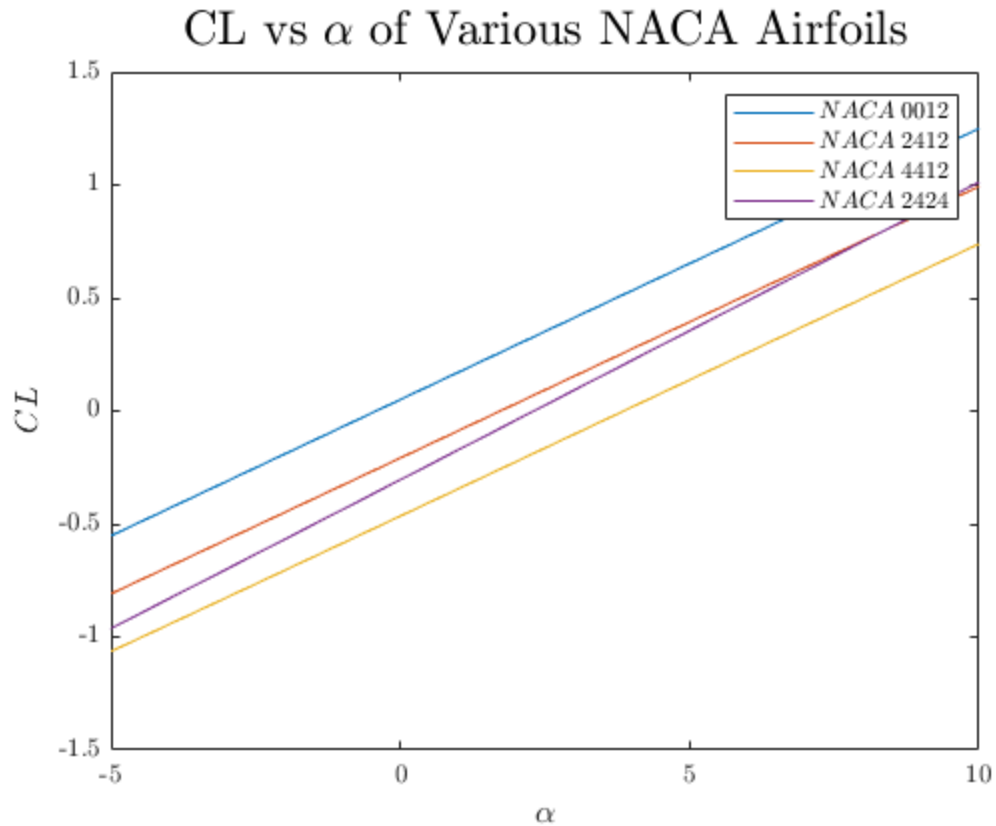
Thin Airfoil Theory Estimated Lift Curve Slope: 6.283185 [1/rad]

Percent Error of Lift Curve Slope Estimates: 16.778582 %

Vortex Panel Estimated Zero Lift AOA: -2.306275 [deg]

Thin Airfoil Theory Estimated Zero Lift AOA: -1.512579 [deg]

Absolute Error of Zero Lift AOA Estimates: 0.215261



## Functions Called

The following functions were built and called as a part of this assignment

[include](#) Question\_2.m [/include include](#) Question\_3.m [/include include](#) NACA\_Airfoil.m [/include include](#) Vortex\_Panel.m [/include include](#) get\_zlaoa\_tat.m [/include](#)

toc

*Elapsed time is 22.543143 seconds.*

*Published with MATLAB® R2019a*