Table of Contents

Given values

```
s = 24 ; %wing area in m^2
q = .27 * 10^3 ; %dynamic pressure in Pa
CDo = .075 ; %zero-lift drag coefficient
sa = -5 ; %minimum angle of attack in degrees
la = 15 ; %maximum angle of attack in degrees
l_sa = -177.5 ; %lift at min angle of attack in Newtons
l_la = 5452 ; %lift at max angle of attack in Newtons
```

Part A

```
disp( 'Part "a" calculates minimum and maximum coeffecients of lift' )
        CL_min = l_sa / ( q * s ) ; %minimum coeffecient of lift
        CL_max = l_la / ( q * s ) ; %maximum coeffecient of lift
```

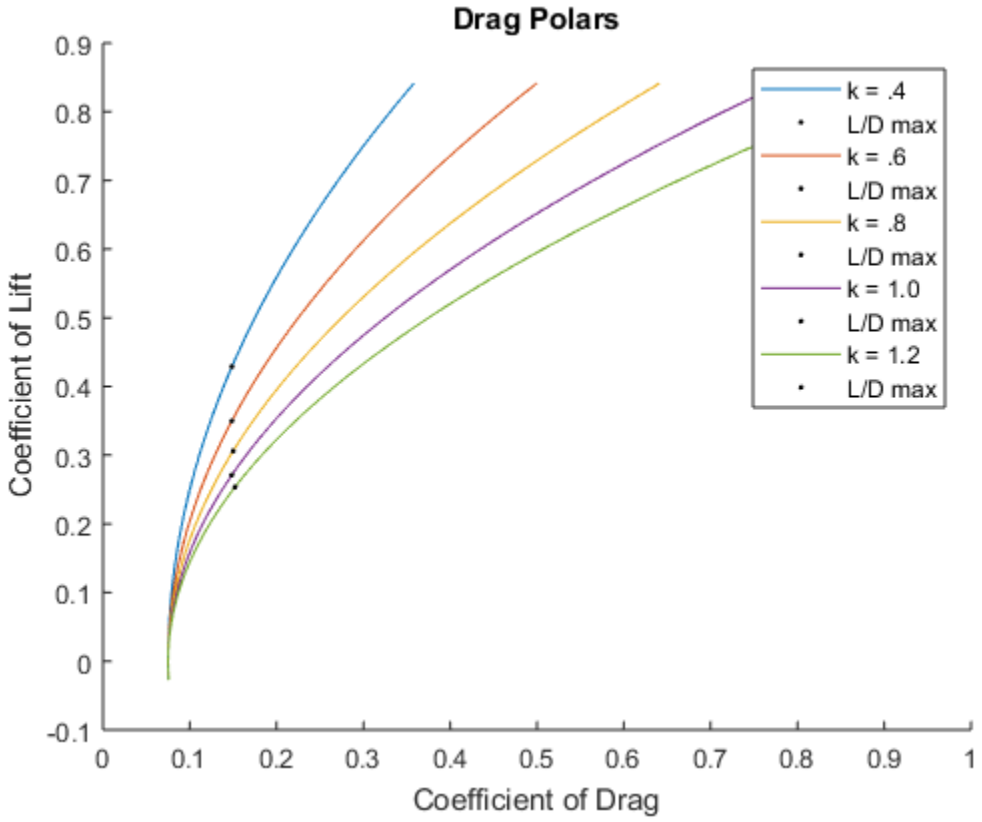
```
Part "a" calculates minimum and maximum coeffecients of lift
```

Part B and C

```
disp( 'Part "b" and "c" create a graph' )
disp( '     See Figure 1' )
    CL = linspace( CL_min , CL_max , 100 ) ; %Coefficients of lift
    k = .4; % k value
    while k <= 1.2

        CD = CDo + k .* CL .^ 2 ; %Coefficients of drag

        %Plots drag polars with dots at L/D max values
        hold on
        plot( CD , CL ) %Plots drag polars
        LD =  CL ./ CD ; %Calculates L/D for all CL and CD values
        [ LD_max , I ] = max( LD ) ; %finds maximum LD value for each
 curve
        plot( CD( I ) , CL ( I ) , '.k' ) %plots all the L/D max
 values onto their corresponding curves

        %Records all LD_max values in a vector for use outside the
 loop
        if k == .4
            LD_maxv(1) = LD_max;
        elseif k == .6
```

```
            LD_maxv(2) = LD_max;
        elseif k == .8
            LD_maxv(3) = LD_max;
        elseif k == 1.0
            LD_maxv(4) = LD_max;
        elseif k == 1.2
            LD_maxv(5) = LD_max;
        end
        k = k + .2 ;
    end

    %labels for the graph
    title ( 'Drag Polars' )
    xlabel( 'Coefficient of Drag' )
    ylabel( 'Coefficient of Lift' )
    legend( 'k = .4' , 'L/D max ' , 'k = .6' , 'L/D max ' , 'k = .8'
 , 'L/D max ' , 'k = 1.0' , 'L/D max ' , 'k = 1.2' , 'L/D max ' )
```

Part "b" and "c" create a graph
See Figure 1



Part D

```
disp( 'Part d' )
    [ LD_max , k ] = max( LD_maxv ); %finds best of the L/D max values
 and associated curve
```

```
    k = .2 + .2 * k ; %converts the index of the curve that the LD_max
 value came from to its corresponding k value
    disp( [ 'The best L/D max is ' , num2str( LD_max ) , ' with a k
 value of ' , num2str( k ) ] )
```

```
Part d
The best L/D max is 2.8866 with a k value of 0.4
```

Published with MATLAB® R2017a