```matlab
close all; clear; clc;
```

Tests

```matlab
load("Data_ft3.mat")
filters = (Cessna0.vZ__ms)<500 & (Cessna0.vZ__ms)>-500 ...
    & Cessna0.alt_1ftmsl < 5200 & Cessna0.alt_1ftmsl > 4800;
velocity = Cessna0.Vtrue_ktas(filters);
% figure
% plot(Cessna0.Vind_kias,'.')

xvec = [497,578,628,719,787,869,951,1034,1119,1180,1243];

for ii = 1:11
    table2(ii,:) = printItem2(Cessna0,xvec(ii),ii);
end
table2(12,:)  = printItem2(Cessna02,425,12);
disp(table2)




BHP = [51,52,52,53,55,57,62,72,80,90,103,103];
for ii = 1:11
    table3(ii,:) = printItem3(Cessna0,xvec(ii),table2(ii,:),BHP(ii));
end
table3(12,:) = printItem3(Cessna02,425,table2(12,:),BHP(12));

figure
hold on
cdtas = fit(table2(:,5),table2(:,13), 'exp2');
plot(cdtas,table2(:,5),table2(:,13),'*')
cdtas3 = fit(table3(:,3),table3(:,6), 'exp2');
plot(cdtas3,table3(:,3),table3(:,6),'*')
ylabel('CD')
xlabel('TAS')
legend("X-Plane Data","X-Plane Curve Fit", "Calculated
 Data", "Calculated Curve Fit")
hold off

figure
hold on
claoa = fit(table2(:,7),table2(:,8), 'poly1');
plot(claoa,table2(:,7),table2(:,8),'*')
claoa = fit(table3(:,8),table3(:,7), 'poly1');
plot(claoa,table3(:,8),table3(:,7),'*')
hold off
ylabel('CL')
xlabel('AoA')
legend("X-Plane Data","X-Plane Curve Fit", "Calculated
 Data", "Calculated Curve Fit")
```

```matlab
figure
hold on
cdcl = fit(table2(:,8),table2(:,13), 'exp2');
plot(cdcl,table2(:,8),table2(:,13),'*')
cdcl = fit(table3(:,7),table3(:,6), 'exp2');
plot(cdcl,table3(:,7),table3(:,6),'*')
hold off
ylabel('CD')
xlabel('CL')
legend("X-Plane Data","X-Plane Curve Fit", "Calculated
 Data", "Calculated Curve Fit")

figure
ldratio = fit(table2(:,5),table2(:,14), 'poly2');
plot(ldratio,table2(:,5),table2(:,14),'*')
xlabel('TAS')
ylabel('L/D')
disp(ldratio)


disp(table3)
function row = printItem2(data,x,num)
    row(1) = num;
    row(2) = data.real_time(x-5);
    row(3) = data.real_time(x);
    row(4) = data.Vind_kias(x);
    row(5) = data.Vtrue_ktas(x);
    row(6) = data.alt_1ftmsl(x);
    row(7) = data.alpha__deg(x);
    row(8) = data.cltotal(x);
    row(9) = data.curnt___lb(x);
    row(10) = data.MP__1_inhg(x);
    row(11) = data.rpm_1_prop(x);
    row(12) = data.thrst_1lb(x);
    row(13) = data.cdtotal(x);
    row(14) = data.LDratio(x);
    fprintf("\nTest Point Number: \t%d \n", num)
    fprintf("Start Time: \t\t%f \n", data.real_time(x-5))
    fprintf("End Time: \t\t%f\n", data.real_time(x))
    fprintf("IAS: \t\t\t%f \n", data.Vind_kias(x))
    fprintf("TAS: \t\t\t%f \n", data.Vtrue_ktas(x))
    fprintf("Altitude: \t\t%f \n", data.alt_1ftmsl(x))
    fprintf("AoA: \t\t\t%f \n", data.alpha__deg(x))
    fprintf("CL: \t\t\t%f \n", data.cltotal(x))
    fprintf("Weight: \t\t%f \n", data.curnt___lb(x))
    fprintf("Manifold Pressure: \t%f \n", data.MP__1_inhg(x))
    fprintf("RPM: \t\t\t%f \n", data.rpm_1_prop(x))
    fprintf("Thrust: \t\t%f \n", data.thrst_1lb(x))
    fprintf("L/D: \t\t\t%f \n", data.LDratio(x))
end

function row = printItem3(data,x,point,BHP)
    qbar = .5*(20.48e-4)*(point(5)*1.68781)^2;
    TAS = point(4)*sqrt(23.77e-4/20.48e-4);
```

```matlab
        thrust = 325*.8*BHP/TAS;
        cd = thrust/(qbar*174);
        row(1) = point(1);
        row(2) = data.flaphandl(x);
        row(3) = TAS;
        row(4) = thrust;
        row(5) = qbar;
        row(6) = cd;
        row(7) = point(8);
        row(8) = point(7);
        row(9) = point(8)/cd;
        fprintf("\nTest Point Number: \t%d \n", point(1))
        fprintf("Flap Setting: \t\t%f \n", data.flaphandl(x))
        fprintf("TAS: \t\t\t%f \n", point(4)*sqrt(23.77e-4/20.48e-4))
        fprintf("Drag: \t\t\t%f \n", thrust)
        fprintf("Q_bar: \t\t\t%f \n", qbar)
        fprintf("C_D: \t\t\t%f \n", cd)
        fprintf("C_L: \t\t\t%f \n", data.cltotal(x))
        fprintf("AoA: \t\t\t%f \n", data.alpha__deg(x))

    end
```

```
Test Point Number:  1
Start Time:   541.218750
End Time:   546.171940
IAS:    52.012650
TAS:    61.023350
Altitude:   4996.754390
AoA:    7.494790
CL:    0.901000
Weight:   2014.065430
Manifold Pressure:  15.504460
RPM:    1786.898560
Thrust:    200.761860
L/D:    9.969810

Test Point Number:  2
Start Time:   621.967160
End Time:   626.960020
IAS:    58.000890
TAS:    65.819170
Altitude:   4996.490230
AoA:    5.986520
CL:    0.777110
Weight:   2013.285030
Manifold Pressure:  15.517410
RPM:    1813.291750
Thrust:    191.503160
L/D:    10.745430

Test Point Number:  3
Start Time:   671.928040
End Time:   683.014950
```

```
IAS:     63.052110
TAS:     69.894190
Altitude:    4996.514650
AoA:     4.934160
CL:    0.690490
Weight:    2012.796260
Manifold Pressure:   15.084600
RPM:    1821.302250
Thrust:    177.272370
L/D:    11.276580


Test Point Number:   4
Start Time:    768.951290
End Time:    773.960080
IAS:     68.922090
TAS:     74.684720
Altitude:    4996.738770
AoA:     3.883820
CL:    0.605770
Weight:    2011.909670
Manifold Pressure:   15.346590
RPM:    1873.680660
Thrust:    176.780610
L/D:    11.657700


Test Point Number:   5
Start Time:    837.097720
End Time:    842.125310
IAS:     74.040380
TAS:     79.835850
Altitude:    4996.216310
AoA:     2.949980
CL:    0.530830
Weight:    2011.235840
Manifold Pressure:   15.133150
RPM:    1910.238530
Thrust:    167.783570
L/D:    11.898730


Test Point Number:   6
Start Time:    919.227420
End Time:    924.223570
IAS:     79.985450
TAS:     86.198360
Altitude:    4996.644040
AoA:     2.024780
CL:    0.456040
Weight:    2010.417720
Manifold Pressure:   15.146370
RPM:    1971.705810
Thrust:    162.397780
L/D:    12.370360


Test Point Number:   7
```

```
Start Time:    1001.114870
End Time:    1006.119020
IAS:    85.021840
TAS:    91.581000
Altitude:    4996.454590
AoA:    1.366410
CL:    0.404340
Weight:    2009.583250
Manifold Pressure:    15.442930
RPM:    2042.219730
Thrust:    164.687320
L/D:    12.161740

Test Point Number:    8
Start Time:    1084.080930
End Time:    1089.108150
IAS:    91.034320
TAS:    98.031770
Altitude:    4996.497070
AoA:    0.715160
CL:    0.353200
Weight:    2008.700200
Manifold Pressure:    15.940220
RPM:    2134.572750
Thrust:    170.524930
L/D:    11.747350

Test Point Number:    9
Start Time:    1169.255370
End Time:    1174.268070
IAS:    97.009850
TAS:    104.457110
Altitude:    4996.478030
AoA:    0.179380
CL:    0.311360
Weight:    2007.758180
Manifold Pressure:    16.809790
RPM:    2239.847660
Thrust:    182.513850
L/D:    11.170640

Test Point Number:    10
Start Time:    1230.318730
End Time:    1235.342770
IAS:    103.008240
TAS:    110.910960
Altitude:    4996.596680
AoA:    -0.269610
CL:    0.276420
Weight:    2007.012820
Manifold Pressure:    17.676140
RPM:    2337.765140
Thrust:    191.444500
L/D:    10.513010
```

```
Test Point Number:  11
Start Time:   1293.419560
End Time:   1298.419680
IAS:   107.953670
TAS:   116.239200
Altitude:   4996.639650
AoA:   -0.586030
CL:   0.251830
Weight:   2006.182370
Manifold Pressure:  18.794650
RPM:   2425.913820
Thrust:   202.965840
L/D:   9.950070

Test Point Number:  12
Start Time:   480.825470
End Time:   485.793610
IAS:   114.503300
TAS:   122.761490
Altitude:   4996.130860
AoA:   -0.931980
CL:   0.224480
Weight:   2004.092530
Manifold Pressure:  15.012760
RPM:   2369.143550
Thrust:   130.997190
L/D:   9.260660
   1.0e+03 *

  Columns 1 through 7

    0.0010    0.5412    0.5462    0.0520    0.0610    4.9968    0.0075
    0.0020    0.6220    0.6270    0.0580    0.0658    4.9965    0.0060
    0.0030    0.6719    0.6830    0.0631    0.0699    4.9965    0.0049
    0.0040    0.7690    0.7740    0.0689    0.0747    4.9967    0.0039
    0.0050    0.8371    0.8421    0.0740    0.0798    4.9962    0.0029
    0.0060    0.9192    0.9242    0.0800    0.0862    4.9966    0.0020
    0.0070    1.0011    1.0061    0.0850    0.0916    4.9965    0.0014
    0.0080    1.0841    1.0891    0.0910    0.0980    4.9965    0.0007
    0.0090    1.1693    1.1743    0.0970    0.1045    4.9965    0.0002
    0.0100    1.2303    1.2353    0.1030    0.1109    4.9966   -0.0003
    0.0110    1.2934    1.2984    0.1080    0.1162    4.9966   -0.0006
    0.0120    0.4808    0.4858    0.1145    0.1228    4.9961   -0.0009

  Columns 8 through 14

    0.0009    2.0141    0.0155    1.7869    0.2008    0.0001    0.0100
    0.0008    2.0133    0.0155    1.8133    0.1915    0.0001    0.0107
    0.0007    2.0128    0.0151    1.8213    0.1773    0.0001    0.0113
    0.0006    2.0119    0.0153    1.8737    0.1768    0.0001    0.0117
    0.0005    2.0112    0.0151    1.9102    0.1678    0.0000    0.0119
    0.0005    2.0104    0.0151    1.9717    0.1624    0.0000    0.0124
    0.0004    2.0096    0.0154    2.0422    0.1647    0.0000    0.0122
```

```
0.0004    2.0087    0.0159    2.1346    0.1705    0.0000    0.0117
0.0003    2.0078    0.0168    2.2398    0.1825    0.0000    0.0112
0.0003    2.0070    0.0177    2.3378    0.1914    0.0000    0.0105
0.0003    2.0062    0.0188    2.4259    0.2030    0.0000    0.0100
0.0002    2.0041    0.0150    2.3691    0.1310    0.0000    0.0093
```

Test Point Number: 1
Flap Setting: 0.000000
TAS: 56.034899
Drag: 236.638241
Q_bar: 10.862734
C_D: 0.125198
C_L: 0.901000
AoA: 7.494790

Test Point Number: 2
Flap Setting: 0.000000
TAS: 62.486223
Drag: 216.367695
Q_bar: 12.637229
C_D: 0.098399
C_L: 0.777110
AoA: 5.986520

Test Point Number: 3
Flap Setting: 0.000000
TAS: 67.928064
Drag: 199.034083
Q_bar: 14.250471
C_D: 0.080269
C_L: 0.690490
AoA: 4.934160

Test Point Number: 4
Flap Setting: 0.000000
TAS: 74.251982
Drag: 185.584271
Q_bar: 16.270863
C_D: 0.065551
C_L: 0.605770
AoA: 3.883820

Test Point Number: 5
Flap Setting: 0.000000
TAS: 79.766081
Drag: 179.274196
Q_bar: 18.592722
C_D: 0.055415
C_L: 0.530830
AoA: 2.949980

Test Point Number: 6
Flap Setting: 0.000000

```
TAS:      86.170896
Drag:     171.983822
Q_bar:    21.674300
C_D:      0.045603
C_L:      0.456040
AoA:      2.024780


Test Point Number:   7
Flap Setting:   0.000000
TAS:      91.596760
Drag:     175.988757
Q_bar:    24.465710
C_D:      0.041341
C_L:      0.404340
AoA:      1.366410


Test Point Number:   8
Flap Setting:   0.000000
TAS:      98.074198
Drag:     190.875891
Q_bar:    28.033722
C_D:      0.039131
C_L:      0.353200
AoA:      0.715160


Test Point Number:   9
Flap Setting:   0.000000
TAS:      104.511829
Drag:     199.020534
Q_bar:    31.829006
C_D:      0.035936
C_L:      0.311360
AoA:      0.179380


Test Point Number:   10
Flap Setting:   0.000000
TAS:      110.974087
Drag:     210.860036
Q_bar:    35.883599
C_D:      0.033771
C_L:      0.276420
AoA:      -0.269610


Test Point Number:   11
Flap Setting:   0.000000
TAS:      116.301958
Drag:     230.262676
Q_bar:    39.414162
C_D:      0.033575
C_L:      0.251830
AoA:      -0.586030


Test Point Number:   12
Flap Setting:   0.000000
```

```
TAS:      123.358085
Drag:     217.091568
Q_bar:     43.961385
C_D:      0.028381
C_L:      0.224480
AoA:      -0.931980
      Linear model Poly2:
      ldratio(x) = p1*x^2 + p2*x + p3
      Coefficients (with 95% confidence bounds):
        p1 =    -0.002627  (-0.003015, -0.002238)
        p2 =       0.4639  (0.3925, 0.5352)
        p3 =       -8.392  (-11.55, -5.237)
  Columns 1 through 7


     1.0000          0    56.0349   236.6382    10.8627    0.1252    0.9010
     2.0000          0    62.4862   216.3677    12.6372    0.0984    0.7771
     3.0000          0    67.9281   199.0341    14.2505    0.0803    0.6905
     4.0000          0    74.2520   185.5843    16.2709    0.0656    0.6058
     5.0000          0    79.7661   179.2742    18.5927    0.0554    0.5308
     6.0000          0    86.1709   171.9838    21.6743    0.0456    0.4560
     7.0000          0    91.5968   175.9888    24.4657    0.0413    0.4043
     8.0000          0    98.0742   190.8759    28.0337    0.0391    0.3532
     9.0000          0   104.5118   199.0205    31.8290    0.0359    0.3114
    10.0000          0   110.9741   210.8600    35.8836    0.0338    0.2764
    11.0000          0   116.3020   230.2627    39.4142    0.0336    0.2518
    12.0000          0   123.3581   217.0916    43.9614    0.0284    0.2245


  Columns 8 through 9


     7.4948     7.1966
     5.9865     7.8975
     4.9342     8.6022
     3.8838     9.2412
     2.9500     9.5792
     2.0248    10.0002
     1.3664     9.7807
     0.7152     9.0261
     0.1794     8.6644
    -0.2696     8.1850
    -0.5860     7.5004
    -0.9320     7.9096
```

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