Table of Contents

Reading in CSV Data

```
Experiment_Data = csvread('AutoTuner_Data.csv',1,0);
PhaseDifference_Oscilloscope = Experiment_Data(:,1);
Nominal_PhaseDifference = Experiment_Data(:,2);
Voltage_Readout = Experiment_Data(:,3);
```

Plotting Initial Plots

Need to get rid of first couple datapoints since they are positive and everything else is negative

```
PhaseDifference_Oscilloscope = PhaseDifference_Oscilloscope(4:end)
scatter(PhaseDifference_Oscilloscope,Voltage_Readout(4:end))
title('Voltage Readout vs Measured Phase Difference')
xlabel('Phase Difference (Degrees)')
ylabel('Voltage Readout (Volts)')
hold on

p3 = polyfit(PhaseDifference_Oscilloscope, Voltage_Readout(4:end),3);
poly1 = polyval(p3, PhaseDifference_Oscilloscope)
plot(PhaseDifference_Oscilloscope, poly1)

p5 = polyfit(PhaseDifference_Oscilloscope, Voltage_Readout(4:end),5);
y5 = polyval(p5, PhaseDifference_Oscilloscope)
plot(PhaseDifference_Oscilloscope, y5)

%L is the curve's maximum, which is 1.75 Volts
%x0 is the midpoint of the curve which is going to be 90 degrees
% for the equation f(x) = L/(1+ e^(-k(x-x0))). We need to find k.
 Little
% bit of guess and check makes 0.09 a good value for it.
x = linspace(-180,0,1000)
y = 2.75./(1+exp(0.09*(x+90))) -1
plot(x,y)

legend('Data', '3rd Degree Polynomial Fit','5th Degree Polynomial
 Fit', 'Logistic Fit')

hold off


PhaseDifference_Oscilloscope =

  -175
  -170
```

```
  -165
  -160
  -155
  -149
  -147
  -141
  -138
  -130
  -126
  -121
  -115
  -110
  -105
  -100
   -96
   -90
   -87
   -81
   -76
   -69
   -65
   -61
   -56
   -50
   -46
   -40
   -36
   -29
   -22
   -17
   -13
    -9


poly1 =

   1.4958
   1.6244
   1.7163
   1.7739
   1.7995
   1.7912
   1.7796
   1.7206
   1.6783
   1.5285
   1.4357
   1.3052
   1.1305
   0.9725
   0.8058
   0.6326
   0.4909
   0.2761
```

```
    0.1687
   -0.0434
   -0.2152
   -0.4434
   -0.5652
   -0.6792
   -0.8089
   -0.9429
   -1.0171
   -1.1029
   -1.1414
   -1.1685
   -1.1391
   -1.0798
   -1.0077
   -0.9124
```

Warning: Polynomial is badly conditioned. Add points with distinct X values,
reduce the degree of the polynomial, or try centering and scaling as described
in HELP POLYFIT.

y5 =

```
    1.8648
    1.6720
    1.5798
    1.5558
    1.5728
    1.6158
    1.6305
    1.6631
    1.6684
    1.6309
    1.5796
    1.4832
    1.3212
    1.1512
    0.9544
    0.7368
    0.5526
    0.2685
    0.1266
   -0.1484
   -0.3608
   -0.6192
   -0.7412
   -0.8419
   -0.9362
   -1.0028
   -1.0207
   -1.0142
   -0.9940
```

```
     -0.9490
     -0.9312
     -0.9683
     -1.0487
     -1.1922


x =

  Columns 1 through 7

 -180.0000 -179.8198 -179.6396 -179.4595 -179.2793 -179.0991 -178.9189

  Columns 8 through 14

 -178.7387 -178.5586 -178.3784 -178.1982 -178.0180 -177.8378 -177.6577

  Columns 15 through 21

 -177.4775 -177.2973 -177.1171 -176.9369 -176.7568 -176.5766 -176.3964

  Columns 22 through 28

 -176.2162 -176.0360 -175.8559 -175.6757 -175.4955 -175.3153 -175.1351

  Columns 29 through 35

 -174.9550 -174.7748 -174.5946 -174.4144 -174.2342 -174.0541 -173.8739

  Columns 36 through 42

 -173.6937 -173.5135 -173.3333 -173.1532 -172.9730 -172.7928 -172.6126

  Columns 43 through 49

 -172.4324 -172.2523 -172.0721 -171.8919 -171.7117 -171.5315 -171.3514

  Columns 50 through 56

 -171.1712 -170.9910 -170.8108 -170.6306 -170.4505 -170.2703 -170.0901

  Columns 57 through 63

 -169.9099 -169.7297 -169.5495 -169.3694 -169.1892 -169.0090 -168.8288

  Columns 64 through 70

 -168.6486 -168.4685 -168.2883 -168.1081 -167.9279 -167.7477 -167.5676

  Columns 71 through 77

 -167.3874 -167.2072 -167.0270 -166.8468 -166.6667 -166.4865 -166.3063

  Columns 78 through 84
```

-166.1261 -165.9459 -165.7658 -165.5856 -165.4054 -165.2252 -165.0450

 Columns 85 through 91

-164.8649 -164.6847 -164.5045 -164.3243 -164.1441 -163.9640 -163.7838

 Columns 92 through 98

-163.6036 -163.4234 -163.2432 -163.0631 -162.8829 -162.7027 -162.5225

 Columns 99 through 105

-162.3423 -162.1622 -161.9820 -161.8018 -161.6216 -161.4414 -161.2613

 Columns 106 through 112

-161.0811 -160.9009 -160.7207 -160.5405 -160.3604 -160.1802 -160.0000

 Columns 113 through 119

-159.8198 -159.6396 -159.4595 -159.2793 -159.0991 -158.9189 -158.7387

 Columns 120 through 126

-158.5586 -158.3784 -158.1982 -158.0180 -157.8378 -157.6577 -157.4775

 Columns 127 through 133

-157.2973 -157.1171 -156.9369 -156.7568 -156.5766 -156.3964 -156.2162

 Columns 134 through 140

-156.0360 -155.8559 -155.6757 -155.4955 -155.3153 -155.1351 -154.9550

 Columns 141 through 147

-154.7748 -154.5946 -154.4144 -154.2342 -154.0541 -153.8739 -153.6937

 Columns 148 through 154

-153.5135 -153.3333 -153.1532 -152.9730 -152.7928 -152.6126 -152.4324

 Columns 155 through 161

-152.2523 -152.0721 -151.8919 -151.7117 -151.5315 -151.3514 -151.1712

 Columns 162 through 168

-150.9910 -150.8108 -150.6306 -150.4505 -150.2703 -150.0901 -149.9099

 Columns 169 through 175

-149.7297 -149.5495 -149.3694 -149.1892 -149.0090 -148.8288 -148.6486

Columns 176 through 182

-148.4685 -148.2883 -148.1081 -147.9279 -147.7477 -147.5676 -147.3874

Columns 183 through 189

-147.2072 -147.0270 -146.8468 -146.6667 -146.4865 -146.3063 -146.1261

Columns 190 through 196

-145.9459 -145.7658 -145.5856 -145.4054 -145.2252 -145.0450 -144.8649

Columns 197 through 203

-144.6847 -144.5045 -144.3243 -144.1441 -143.9640 -143.7838 -143.6036

Columns 204 through 210

-143.4234 -143.2432 -143.0631 -142.8829 -142.7027 -142.5225 -142.3423

Columns 211 through 217

-142.1622 -141.9820 -141.8018 -141.6216 -141.4414 -141.2613 -141.0811

Columns 218 through 224

-140.9009 -140.7207 -140.5405 -140.3604 -140.1802 -140.0000 -139.8198

Columns 225 through 231

-139.6396 -139.4595 -139.2793 -139.0991 -138.9189 -138.7387 -138.5586

Columns 232 through 238

-138.3784 -138.1982 -138.0180 -137.8378 -137.6577 -137.4775 -137.2973

Columns 239 through 245

-137.1171 -136.9369 -136.7568 -136.5766 -136.3964 -136.2162 -136.0360

Columns 246 through 252

-135.8559 -135.6757 -135.4955 -135.3153 -135.1351 -134.9550 -134.7748

Columns 253 through 259

-134.5946 -134.4144 -134.2342 -134.0541 -133.8739 -133.6937 -133.5135

Columns 260 through 266

-133.3333 -133.1532 -132.9730 -132.7928 -132.6126 -132.4324 -132.2523

Columns 267 through 273

-132.0721 -131.8919 -131.7117 -131.5315 -131.3514 -131.1712 -130.9910

 Columns 274 through 280

-130.8108 -130.6306 -130.4505 -130.2703 -130.0901 -129.9099 -129.7297

 Columns 281 through 287

-129.5495 -129.3694 -129.1892 -129.0090 -128.8288 -128.6486 -128.4685

 Columns 288 through 294

-128.2883 -128.1081 -127.9279 -127.7477 -127.5676 -127.3874 -127.2072

 Columns 295 through 301

-127.0270 -126.8468 -126.6667 -126.4865 -126.3063 -126.1261 -125.9459

 Columns 302 through 308

-125.7658 -125.5856 -125.4054 -125.2252 -125.0450 -124.8649 -124.6847

 Columns 309 through 315

-124.5045 -124.3243 -124.1441 -123.9640 -123.7838 -123.6036 -123.4234

 Columns 316 through 322

-123.2432 -123.0631 -122.8829 -122.7027 -122.5225 -122.3423 -122.1622

 Columns 323 through 329

-121.9820 -121.8018 -121.6216 -121.4414 -121.2613 -121.0811 -120.9009

 Columns 330 through 336

-120.7207 -120.5405 -120.3604 -120.1802 -120.0000 -119.8198 -119.6396

 Columns 337 through 343

-119.4595 -119.2793 -119.0991 -118.9189 -118.7387 -118.5586 -118.3784

 Columns 344 through 350

-118.1982 -118.0180 -117.8378 -117.6577 -117.4775 -117.2973 -117.1171

 Columns 351 through 357

-116.9369 -116.7568 -116.5766 -116.3964 -116.2162 -116.0360 -115.8559

 Columns 358 through 364

-115.6757 -115.4955 -115.3153 -115.1351 -114.9550 -114.7748 -114.5946

Columns 365 through 371

-114.4144 -114.2342 -114.0541 -113.8739 -113.6937 -113.5135 -113.3333

Columns 372 through 378

-113.1532 -112.9730 -112.7928 -112.6126 -112.4324 -112.2523 -112.0721

Columns 379 through 385

-111.8919 -111.7117 -111.5315 -111.3514 -111.1712 -110.9910 -110.8108

Columns 386 through 392

-110.6306 -110.4505 -110.2703 -110.0901 -109.9099 -109.7297 -109.5495

Columns 393 through 399

-109.3694 -109.1892 -109.0090 -108.8288 -108.6486 -108.4685 -108.2883

Columns 400 through 406

-108.1081 -107.9279 -107.7477 -107.5676 -107.3874 -107.2072 -107.0270

Columns 407 through 413

-106.8468 -106.6667 -106.4865 -106.3063 -106.1261 -105.9459 -105.7658

Columns 414 through 420

-105.5856 -105.4054 -105.2252 -105.0450 -104.8649 -104.6847 -104.5045

Columns 421 through 427

-104.3243 -104.1441 -103.9640 -103.7838 -103.6036 -103.4234 -103.2432

Columns 428 through 434

-103.0631 -102.8829 -102.7027 -102.5225 -102.3423 -102.1622 -101.9820

Columns 435 through 441

-101.8018 -101.6216 -101.4414 -101.2613 -101.0811 -100.9009 -100.7207

Columns 442 through 448

-100.5405 -100.3604 -100.1802 -100.0000 -99.8198 -99.6396 -99.4595

Columns 449 through 455

 -99.2793 -99.0991 -98.9189 -98.7387 -98.5586 -98.3784 -98.1982

Columns 456 through 462

-98.0180 -97.8378 -97.6577 -97.4775 -97.2973 -97.1171 -96.9369

Columns 463 through 469

-96.7568 -96.5766 -96.3964 -96.2162 -96.0360 -95.8559 -95.6757

Columns 470 through 476

-95.4955 -95.3153 -95.1351 -94.9550 -94.7748 -94.5946 -94.4144

Columns 477 through 483

-94.2342 -94.0541 -93.8739 -93.6937 -93.5135 -93.3333 -93.1532

Columns 484 through 490

-92.9730 -92.7928 -92.6126 -92.4324 -92.2523 -92.0721 -91.8919

Columns 491 through 497

-91.7117 -91.5315 -91.3514 -91.1712 -90.9910 -90.8108 -90.6306

Columns 498 through 504

-90.4505 -90.2703 -90.0901 -89.9099 -89.7297 -89.5495 -89.3694

Columns 505 through 511

-89.1892 -89.0090 -88.8288 -88.6486 -88.4685 -88.2883 -88.1081

Columns 512 through 518

-87.9279 -87.7477 -87.5676 -87.3874 -87.2072 -87.0270 -86.8468

Columns 519 through 525

-86.6667 -86.4865 -86.3063 -86.1261 -85.9459 -85.7658 -85.5856

Columns 526 through 532

-85.4054 -85.2252 -85.0450 -84.8649 -84.6847 -84.5045 -84.3243

Columns 533 through 539

-84.1441 -83.9640 -83.7838 -83.6036 -83.4234 -83.2432 -83.0631

Columns 540 through 546

-82.8829 -82.7027 -82.5225 -82.3423 -82.1622 -81.9820 -81.8018

Columns 547 through 553

-81.6216 -81.4414 -81.2613 -81.0811 -80.9009 -80.7207 -80.5405

Columns 554 through 560

-80.3604 -80.1802 -80.0000 -79.8198 -79.6396 -79.4595 -79.2793

Columns 561 through 567

-79.0991 -78.9189 -78.7387 -78.5586 -78.3784 -78.1982 -78.0180

Columns 568 through 574

-77.8378 -77.6577 -77.4775 -77.2973 -77.1171 -76.9369 -76.7568

Columns 575 through 581

-76.5766 -76.3964 -76.2162 -76.0360 -75.8559 -75.6757 -75.4955

Columns 582 through 588

-75.3153 -75.1351 -74.9550 -74.7748 -74.5946 -74.4144 -74.2342

Columns 589 through 595

-74.0541 -73.8739 -73.6937 -73.5135 -73.3333 -73.1532 -72.9730

Columns 596 through 602

-72.7928 -72.6126 -72.4324 -72.2523 -72.0721 -71.8919 -71.7117

Columns 603 through 609

-71.5315 -71.3514 -71.1712 -70.9910 -70.8108 -70.6306 -70.4505

Columns 610 through 616

-70.2703 -70.0901 -69.9099 -69.7297 -69.5495 -69.3694 -69.1892

Columns 617 through 623

-69.0090 -68.8288 -68.6486 -68.4685 -68.2883 -68.1081 -67.9279

Columns 624 through 630

-67.7477 -67.5676 -67.3874 -67.2072 -67.0270 -66.8468 -66.6667

Columns 631 through 637

-66.4865 -66.3063 -66.1261 -65.9459 -65.7658 -65.5856 -65.4054

Columns 638 through 644

-65.2252 -65.0450 -64.8649 -64.6847 -64.5045 -64.3243 -64.1441

Columns 645 through 651

-63.9640   -63.7838   -63.6036   -63.4234   -63.2432   -63.0631   -62.8829

Columns 652 through 658

-62.7027   -62.5225   -62.3423   -62.1622   -61.9820   -61.8018   -61.6216

Columns 659 through 665

-61.4414   -61.2613   -61.0811   -60.9009   -60.7207   -60.5405   -60.3604

Columns 666 through 672

-60.1802   -60.0000   -59.8198   -59.6396   -59.4595   -59.2793   -59.0991

Columns 673 through 679

-58.9189   -58.7387   -58.5586   -58.3784   -58.1982   -58.0180   -57.8378

Columns 680 through 686

-57.6577   -57.4775   -57.2973   -57.1171   -56.9369   -56.7568   -56.5766

Columns 687 through 693

-56.3964   -56.2162   -56.0360   -55.8559   -55.6757   -55.4955   -55.3153

Columns 694 through 700

-55.1351   -54.9550   -54.7748   -54.5946   -54.4144   -54.2342   -54.0541

Columns 701 through 707

-53.8739   -53.6937   -53.5135   -53.3333   -53.1532   -52.9730   -52.7928

Columns 708 through 714

-52.6126   -52.4324   -52.2523   -52.0721   -51.8919   -51.7117   -51.5315

Columns 715 through 721

-51.3514   -51.1712   -50.9910   -50.8108   -50.6306   -50.4505   -50.2703

Columns 722 through 728

-50.0901   -49.9099   -49.7297   -49.5495   -49.3694   -49.1892   -49.0090

Columns 729 through 735

-48.8288   -48.6486   -48.4685   -48.2883   -48.1081   -47.9279   -47.7477

Columns 736 through 742

-47.5676   -47.3874   -47.2072   -47.0270   -46.8468   -46.6667   -46.4865

Columns 743 through 749

-46.3063   -46.1261   -45.9459   -45.7658   -45.5856   -45.4054   -45.2252

Columns 750 through 756

-45.0450   -44.8649   -44.6847   -44.5045   -44.3243   -44.1441   -43.9640

Columns 757 through 763

-43.7838   -43.6036   -43.4234   -43.2432   -43.0631   -42.8829   -42.7027

Columns 764 through 770

-42.5225   -42.3423   -42.1622   -41.9820   -41.8018   -41.6216   -41.4414

Columns 771 through 777

-41.2613   -41.0811   -40.9009   -40.7207   -40.5405   -40.3604   -40.1802

Columns 778 through 784

-40.0000   -39.8198   -39.6396   -39.4595   -39.2793   -39.0991   -38.9189

Columns 785 through 791

-38.7387   -38.5586   -38.3784   -38.1982   -38.0180   -37.8378   -37.6577

Columns 792 through 798

-37.4775   -37.2973   -37.1171   -36.9369   -36.7568   -36.5766   -36.3964

Columns 799 through 805

-36.2162   -36.0360   -35.8559   -35.6757   -35.4955   -35.3153   -35.1351

Columns 806 through 812

-34.9550   -34.7748   -34.5946   -34.4144   -34.2342   -34.0541   -33.8739

Columns 813 through 819

-33.6937   -33.5135   -33.3333   -33.1532   -32.9730   -32.7928   -32.6126

Columns 820 through 826

-32.4324   -32.2523   -32.0721   -31.8919   -31.7117   -31.5315   -31.3514

Columns 827 through 833

-31.1712   -30.9910   -30.8108   -30.6306   -30.4505   -30.2703   -30.0901

Columns 834 through 840

-29.9099   -29.7297   -29.5495   -29.3694   -29.1892   -29.0090   -28.8288

Columns 841 through 847

-28.6486   -28.4685   -28.2883   -28.1081   -27.9279   -27.7477   -27.5676

Columns 848 through 854

-27.3874   -27.2072   -27.0270   -26.8468   -26.6667   -26.4865   -26.3063

Columns 855 through 861

-26.1261   -25.9459   -25.7658   -25.5856   -25.4054   -25.2252   -25.0450

Columns 862 through 868

-24.8649   -24.6847   -24.5045   -24.3243   -24.1441   -23.9640   -23.7838

Columns 869 through 875

-23.6036   -23.4234   -23.2432   -23.0631   -22.8829   -22.7027   -22.5225

Columns 876 through 882

-22.3423   -22.1622   -21.9820   -21.8018   -21.6216   -21.4414   -21.2613

Columns 883 through 889

-21.0811   -20.9009   -20.7207   -20.5405   -20.3604   -20.1802   -20.0000

Columns 890 through 896

-19.8198   -19.6396   -19.4595   -19.2793   -19.0991   -18.9189   -18.7387

Columns 897 through 903

-18.5586   -18.3784   -18.1982   -18.0180   -17.8378   -17.6577   -17.4775

Columns 904 through 910

-17.2973   -17.1171   -16.9369   -16.7568   -16.5766   -16.3964   -16.2162

Columns 911 through 917

-16.0360   -15.8559   -15.6757   -15.4955   -15.3153   -15.1351   -14.9550

Columns 918 through 924

-14.7748   -14.5946   -14.4144   -14.2342   -14.0541   -13.8739   -13.6937

Columns 925 through 931

-13.5135   -13.3333   -13.1532   -12.9730   -12.7928   -12.6126   -12.4324

```
Columns 932 through 938

-12.2523  -12.0721  -11.8919  -11.7117  -11.5315  -11.3514  -11.1712

Columns 939 through 945

-10.9910  -10.8108  -10.6306  -10.4505  -10.2703  -10.0901   -9.9099

Columns 946 through 952

 -9.7297   -9.5495   -9.3694   -9.1892   -9.0090   -8.8288   -8.6486

Columns 953 through 959

 -8.4685   -8.2883   -8.1081   -7.9279   -7.7477   -7.5676   -7.3874

Columns 960 through 966

 -7.2072   -7.0270   -6.8468   -6.6667   -6.4865   -6.3063   -6.1261

Columns 967 through 973

 -5.9459   -5.7658   -5.5856   -5.4054   -5.2252   -5.0450   -4.8649

Columns 974 through 980

 -4.6847   -4.5045   -4.3243   -4.1441   -3.9640   -3.7838   -3.6036

Columns 981 through 987

 -3.4234   -3.2432   -3.0631   -2.8829   -2.7027   -2.5225   -2.3423

Columns 988 through 994

 -2.1622   -1.9820   -1.8018   -1.6216   -1.4414   -1.2613   -1.0811

Columns 995 through 1000

 -0.9009   -0.7207   -0.5405   -0.3604   -0.1802         0

y =

Columns 1 through 7

   1.7492    1.7492    1.7491    1.7491    1.7491    1.7491    1.7491

Columns 8 through 14

   1.7491    1.7490    1.7490    1.7490    1.7490    1.7490    1.7490

Columns 15 through 21
```

```
    1.7490     1.7489     1.7489     1.7489     1.7489     1.7489     1.7488

Columns 22 through 28

    1.7488     1.7488     1.7488     1.7488     1.7487     1.7487     1.7487

Columns 29 through 35

    1.7487     1.7487     1.7486     1.7486     1.7486     1.7486     1.7486

Columns 36 through 42

    1.7485     1.7485     1.7485     1.7485     1.7484     1.7484     1.7484

Columns 43 through 49

    1.7484     1.7483     1.7483     1.7483     1.7482     1.7482     1.7482

Columns 50 through 56

    1.7482     1.7481     1.7481     1.7481     1.7480     1.7480     1.7480

Columns 57 through 63

    1.7479     1.7479     1.7479     1.7478     1.7478     1.7478     1.7477

Columns 64 through 70

    1.7477     1.7476     1.7476     1.7476     1.7475     1.7475     1.7474

Columns 71 through 77

    1.7474     1.7474     1.7473     1.7473     1.7472     1.7472     1.7471

Columns 78 through 84

    1.7471     1.7470     1.7470     1.7469     1.7469     1.7468     1.7468

Columns 85 through 91

    1.7467     1.7467     1.7466     1.7466     1.7465     1.7465     1.7464

Columns 92 through 98

    1.7464     1.7463     1.7462     1.7462     1.7461     1.7460     1.7460

Columns 99 through 105

    1.7459     1.7458     1.7458     1.7457     1.7456     1.7456     1.7455

Columns 106 through 112

    1.7454     1.7454     1.7453     1.7452     1.7451     1.7450     1.7450
```

Columns 113 through 119

   1.7449   1.7448   1.7447   1.7446   1.7445   1.7444   1.7444

Columns 120 through 126

   1.7443   1.7442   1.7441   1.7440   1.7439   1.7438   1.7437

Columns 127 through 133

   1.7436   1.7435   1.7434   1.7433   1.7431   1.7430   1.7429

Columns 134 through 140

   1.7428   1.7427   1.7426   1.7424   1.7423   1.7422   1.7421

Columns 141 through 147

   1.7419   1.7418   1.7417   1.7415   1.7414   1.7413   1.7411

Columns 148 through 154

   1.7410   1.7408   1.7407   1.7405   1.7404   1.7402   1.7401

Columns 155 through 161

   1.7399   1.7397   1.7396   1.7394   1.7392   1.7390   1.7389

Columns 162 through 168

   1.7387   1.7385   1.7383   1.7381   1.7379   1.7377   1.7375

Columns 169 through 175

   1.7373   1.7371   1.7369   1.7367   1.7365   1.7363   1.7360

Columns 176 through 182

   1.7358   1.7356   1.7354   1.7351   1.7349   1.7346   1.7344

Columns 183 through 189

   1.7341   1.7339   1.7336   1.7333   1.7331   1.7328   1.7325

Columns 190 through 196

   1.7322   1.7319   1.7316   1.7313   1.7310   1.7307   1.7304

Columns 197 through 203

   1.7301   1.7298   1.7295   1.7291   1.7288   1.7284   1.7281

Columns 204 through 210

1.7277   1.7274   1.7270   1.7266   1.7263   1.7259   1.7255

Columns 211 through 217

  1.7251   1.7247   1.7243   1.7238   1.7234   1.7230   1.7226

Columns 218 through 224

  1.7221   1.7217   1.7212   1.7207   1.7203   1.7198   1.7193

Columns 225 through 231

  1.7188   1.7183   1.7178   1.7173   1.7167   1.7162   1.7157

Columns 232 through 238

  1.7151   1.7145   1.7140   1.7134   1.7128   1.7122   1.7116

Columns 239 through 245

  1.7110   1.7103   1.7097   1.7090   1.7084   1.7077   1.7070

Columns 246 through 252

  1.7063   1.7056   1.7049   1.7042   1.7035   1.7027   1.7020

Columns 253 through 259

  1.7012   1.7004   1.6996   1.6988   1.6980   1.6971   1.6963

Columns 260 through 266

  1.6954   1.6946   1.6937   1.6928   1.6919   1.6909   1.6900

Columns 267 through 273

  1.6890   1.6881   1.6871   1.6861   1.6850   1.6840   1.6829

Columns 274 through 280

  1.6819   1.6808   1.6797   1.6786   1.6774   1.6763   1.6751

Columns 281 through 287

  1.6739   1.6727   1.6715   1.6702   1.6690   1.6677   1.6664

Columns 288 through 294

  1.6651   1.6637   1.6623   1.6610   1.6595   1.6581   1.6567

Columns 295 through 301

  1.6552   1.6537   1.6522   1.6506   1.6491   1.6475   1.6459

Columns 302 through 308

   1.6442   1.6426   1.6409   1.6392   1.6374   1.6357   1.6339

Columns 309 through 315

   1.6321   1.6302   1.6284   1.6265   1.6245   1.6226   1.6206

Columns 316 through 322

   1.6186   1.6165   1.6144   1.6123   1.6102   1.6080   1.6058

Columns 323 through 329

   1.6036   1.6013   1.5990   1.5967   1.5944   1.5920   1.5895

Columns 330 through 336

   1.5871   1.5846   1.5820   1.5794   1.5768   1.5742   1.5715

Columns 337 through 343

   1.5688   1.5660   1.5632   1.5603   1.5575   1.5545   1.5516

Columns 344 through 350

   1.5486   1.5455   1.5424   1.5393   1.5361   1.5329   1.5296

Columns 351 through 357

   1.5263   1.5230   1.5196   1.5161   1.5126   1.5091   1.5055

Columns 358 through 364

   1.5019   1.4982   1.4944   1.4907   1.4868   1.4829   1.4790

Columns 365 through 371

   1.4750   1.4710   1.4669   1.4627   1.4585   1.4543   1.4500

Columns 372 through 378

   1.4456   1.4412   1.4367   1.4322   1.4276   1.4230   1.4183

Columns 379 through 385

   1.4135   1.4087   1.4038   1.3989   1.3939   1.3888   1.3837

Columns 386 through 392

   1.3785   1.3733   1.3680   1.3626   1.3572   1.3517   1.3461

Columns 393 through 399

1.3405   1.3348   1.3291   1.3233   1.3174   1.3115   1.3054

Columns 400 through 406

1.2994   1.2932   1.2870   1.2807   1.2744   1.2680   1.2615

Columns 407 through 413

1.2549   1.2483   1.2416   1.2349   1.2281   1.2212   1.2142

Columns 414 through 420

1.2072   1.2001   1.1929   1.1857   1.1784   1.1710   1.1635

Columns 421 through 427

1.1560   1.1484   1.1408   1.1331   1.1253   1.1174   1.1095

Columns 428 through 434

1.1015   1.0934   1.0853   1.0770   1.0688   1.0604   1.0520

Columns 435 through 441

1.0435   1.0350   1.0264   1.0177   1.0089   1.0001   0.9913

Columns 442 through 448

0.9823   0.9733   0.9642   0.9551   0.9459   0.9367   0.9273

Columns 449 through 455

0.9180   0.9085   0.8990   0.8895   0.8798   0.8702   0.8604

Columns 456 through 462

0.8507   0.8408   0.8309   0.8210   0.8110   0.8009   0.7908

Columns 463 through 469

0.7807   0.7704   0.7602   0.7499   0.7396   0.7292   0.7187

Columns 470 through 476

0.7083   0.6978   0.6872   0.6766   0.6660   0.6553   0.6446

Columns 477 through 483

0.6339   0.6231   0.6123   0.6015   0.5906   0.5797   0.5688

Columns 484 through 490

0.5579   0.5469   0.5359   0.5249   0.5139   0.5028   0.4918

Columns 491 through 497

   0.4807   0.4696   0.4585   0.4474   0.4363   0.4251   0.4140

Columns 498 through 504

   0.4029   0.3917   0.3806   0.3694   0.3583   0.3471   0.3360

Columns 505 through 511

   0.3249   0.3137   0.3026   0.2915   0.2804   0.2693   0.2582

Columns 512 through 518

   0.2472   0.2361   0.2251   0.2141   0.2031   0.1921   0.1812

Columns 519 through 525

   0.1703   0.1594   0.1485   0.1377   0.1269   0.1161   0.1054

Columns 526 through 532

   0.0947   0.0840   0.0734   0.0628   0.0522   0.0417   0.0313

Columns 533 through 539

   0.0208   0.0104   0.0001   -0.0102   -0.0204   -0.0307   -0.0408

Columns 540 through 546

  -0.0509   -0.0610   -0.0710   -0.0809   -0.0908   -0.1007   -0.1104

Columns 547 through 553

  -0.1202   -0.1298   -0.1395   -0.1490   -0.1585   -0.1680   -0.1773

Columns 554 through 560

  -0.1867   -0.1959   -0.2051   -0.2142   -0.2233   -0.2323   -0.2413

Columns 561 through 567

  -0.2501   -0.2589   -0.2677   -0.2764   -0.2850   -0.2935   -0.3020

Columns 568 through 574

  -0.3104   -0.3188   -0.3270   -0.3353   -0.3434   -0.3515   -0.3595

Columns 575 through 581

  -0.3674   -0.3753   -0.3831   -0.3908   -0.3984   -0.4060   -0.4135

Columns 582 through 588

-0.4210   -0.4284   -0.4357   -0.4429   -0.4501   -0.4572   -0.4642

Columns 589 through 595

  -0.4712   -0.4781   -0.4849   -0.4916   -0.4983   -0.5049   -0.5115

Columns 596 through 602

  -0.5180   -0.5244   -0.5307   -0.5370   -0.5432   -0.5494   -0.5554

Columns 603 through 609

  -0.5615   -0.5674   -0.5733   -0.5791   -0.5848   -0.5905   -0.5961

Columns 610 through 616

  -0.6017   -0.6072   -0.6126   -0.6180   -0.6233   -0.6285   -0.6337

Columns 617 through 623

  -0.6388   -0.6439   -0.6489   -0.6538   -0.6587   -0.6635   -0.6683

Columns 624 through 630

  -0.6730   -0.6776   -0.6822   -0.6867   -0.6912   -0.6956   -0.7000

Columns 631 through 637

  -0.7043   -0.7085   -0.7127   -0.7169   -0.7210   -0.7250   -0.7290

Columns 638 through 644

  -0.7329   -0.7368   -0.7407   -0.7444   -0.7482   -0.7519   -0.7555

Columns 645 through 651

  -0.7591   -0.7626   -0.7661   -0.7696   -0.7730   -0.7763   -0.7796

Columns 652 through 658

  -0.7829   -0.7861   -0.7893   -0.7924   -0.7955   -0.7986   -0.8016

Columns 659 through 665

  -0.8045   -0.8075   -0.8103   -0.8132   -0.8160   -0.8188   -0.8215

Columns 666 through 672

  -0.8242   -0.8268   -0.8294   -0.8320   -0.8346   -0.8371   -0.8395

Columns 673 through 679

  -0.8420   -0.8444   -0.8467   -0.8490   -0.8513   -0.8536   -0.8558

Columns 680 through 686

  -0.8580   -0.8602   -0.8623   -0.8644   -0.8665   -0.8686   -0.8706

Columns 687 through 693

  -0.8726   -0.8745   -0.8765   -0.8784   -0.8802   -0.8821   -0.8839

Columns 694 through 700

  -0.8857   -0.8874   -0.8892   -0.8909   -0.8926   -0.8942   -0.8959

Columns 701 through 707

  -0.8975   -0.8991   -0.9006   -0.9022   -0.9037   -0.9052   -0.9067

Columns 708 through 714

  -0.9081   -0.9095   -0.9110   -0.9123   -0.9137   -0.9151   -0.9164

Columns 715 through 721

  -0.9177   -0.9190   -0.9202   -0.9215   -0.9227   -0.9239   -0.9251

Columns 722 through 728

  -0.9263   -0.9274   -0.9286   -0.9297   -0.9308   -0.9319   -0.9329

Columns 729 through 735

  -0.9340   -0.9350   -0.9361   -0.9371   -0.9381   -0.9390   -0.9400

Columns 736 through 742

  -0.9409   -0.9419   -0.9428   -0.9437   -0.9446   -0.9454   -0.9463

Columns 743 through 749

  -0.9471   -0.9480   -0.9488   -0.9496   -0.9504   -0.9512   -0.9520

Columns 750 through 756

  -0.9527   -0.9535   -0.9542   -0.9549   -0.9556   -0.9563   -0.9570

Columns 757 through 763

  -0.9577   -0.9584   -0.9590   -0.9597   -0.9603   -0.9610   -0.9616

Columns 764 through 770

  -0.9622   -0.9628   -0.9634   -0.9640   -0.9645   -0.9651   -0.9657

Columns 771 through 777

-0.9662   -0.9667   -0.9673   -0.9678   -0.9683   -0.9688   -0.9693

Columns 778 through 784

-0.9698   -0.9703   -0.9707   -0.9712   -0.9717   -0.9721   -0.9726

Columns 785 through 791

-0.9730   -0.9734   -0.9738   -0.9743   -0.9747   -0.9751   -0.9755

Columns 792 through 798

-0.9759   -0.9763   -0.9766   -0.9770   -0.9774   -0.9777   -0.9781

Columns 799 through 805

-0.9784   -0.9788   -0.9791   -0.9795   -0.9798   -0.9801   -0.9804

Columns 806 through 812

-0.9807   -0.9810   -0.9813   -0.9816   -0.9819   -0.9822   -0.9825

Columns 813 through 819

-0.9828   -0.9831   -0.9833   -0.9836   -0.9839   -0.9841   -0.9844

Columns 820 through 826

-0.9846   -0.9849   -0.9851   -0.9854   -0.9856   -0.9858   -0.9860

Columns 827 through 833

-0.9863   -0.9865   -0.9867   -0.9869   -0.9871   -0.9873   -0.9875

Columns 834 through 840

-0.9877   -0.9879   -0.9881   -0.9883   -0.9885   -0.9887   -0.9889

Columns 841 through 847

-0.9890   -0.9892   -0.9894   -0.9896   -0.9897   -0.9899   -0.9901

Columns 848 through 854

-0.9902   -0.9904   -0.9905   -0.9907   -0.9908   -0.9910   -0.9911

Columns 855 through 861

-0.9913   -0.9914   -0.9915   -0.9917   -0.9918   -0.9919   -0.9921

Columns 862 through 868

-0.9922   -0.9923   -0.9924   -0.9926   -0.9927   -0.9928   -0.9929

Columns 869 through 875

  -0.9930   -0.9931   -0.9933   -0.9934   -0.9935   -0.9936   -0.9937

Columns 876 through 882

  -0.9938   -0.9939   -0.9940   -0.9941   -0.9942   -0.9943   -0.9944

Columns 883 through 889

  -0.9944   -0.9945   -0.9946   -0.9947   -0.9948   -0.9949   -0.9950

Columns 890 through 896

  -0.9950   -0.9951   -0.9952   -0.9953   -0.9954   -0.9954   -0.9955

Columns 897 through 903

  -0.9956   -0.9956   -0.9957   -0.9958   -0.9958   -0.9959   -0.9960

Columns 904 through 910

  -0.9960   -0.9961   -0.9962   -0.9962   -0.9963   -0.9964   -0.9964

Columns 911 through 917

  -0.9965   -0.9965   -0.9966   -0.9966   -0.9967   -0.9967   -0.9968

Columns 918 through 924

  -0.9968   -0.9969   -0.9969   -0.9970   -0.9970   -0.9971   -0.9971

Columns 925 through 931

  -0.9972   -0.9972   -0.9973   -0.9973   -0.9974   -0.9974   -0.9974

Columns 932 through 938

  -0.9975   -0.9975   -0.9976   -0.9976   -0.9976   -0.9977   -0.9977

Columns 939 through 945

  -0.9978   -0.9978   -0.9978   -0.9979   -0.9979   -0.9979   -0.9980

Columns 946 through 952

  -0.9980   -0.9980   -0.9981   -0.9981   -0.9981   -0.9982   -0.9982

Columns 953 through 959

  -0.9982   -0.9982   -0.9983   -0.9983   -0.9983   -0.9984   -0.9984

Columns 960 through 966

```
 -0.9984   -0.9984   -0.9985   -0.9985   -0.9985   -0.9985   -0.9986

Columns 967 through 973

 -0.9986   -0.9986   -0.9986   -0.9986   -0.9987   -0.9987   -0.9987

Columns 974 through 980

 -0.9987   -0.9987   -0.9988   -0.9988   -0.9988   -0.9988   -0.9988

Columns 981 through 987

 -0.9989   -0.9989   -0.9989   -0.9989   -0.9989   -0.9990   -0.9990

Columns 988 through 994

 -0.9990   -0.9990   -0.9990   -0.9990   -0.9990   -0.9991   -0.9991

Columns 995 through 1000

 -0.9991   -0.9991   -0.9991   -0.9991   -0.9992   -0.9992
```
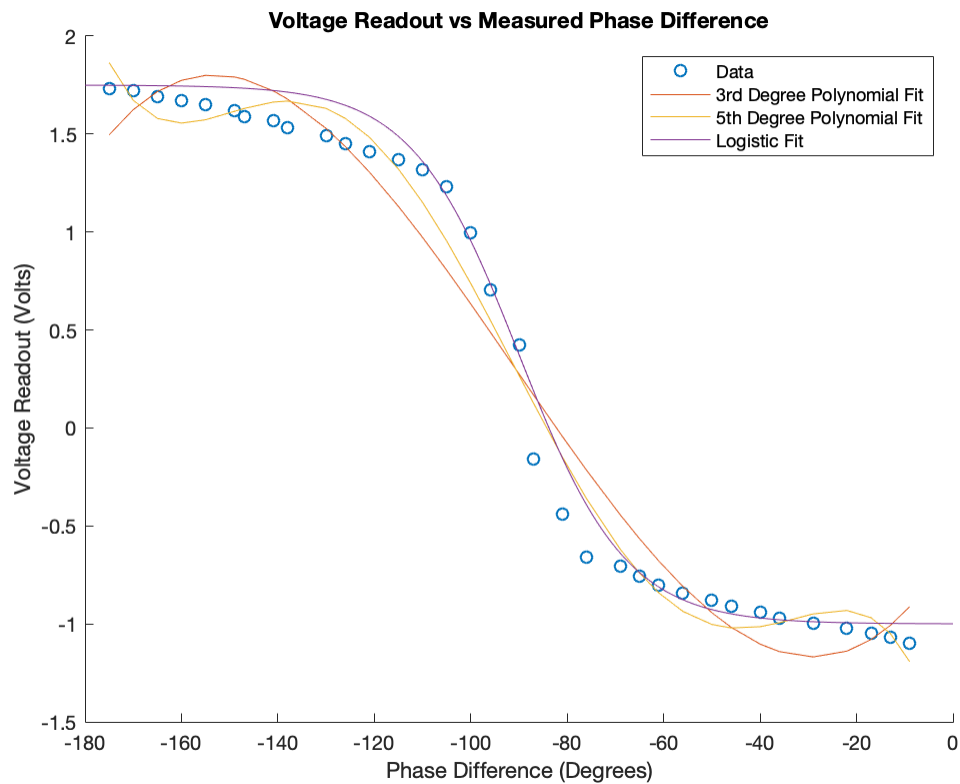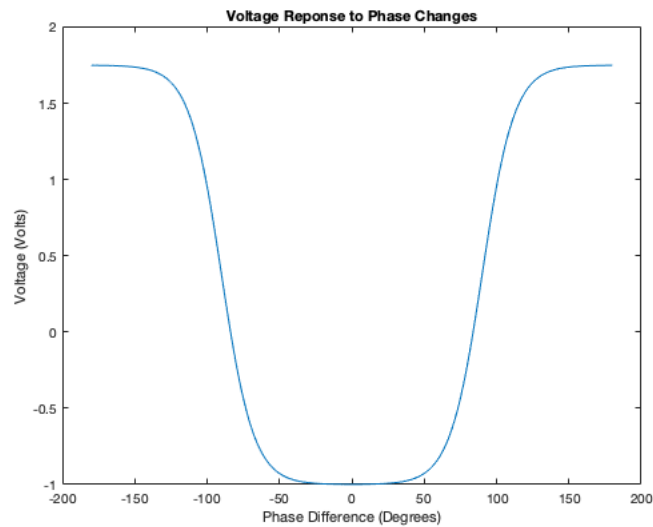

Making full plot

```
x2 = linspace(0,180,1000);
```

```
y2 = 2.75./(1+exp(-0.09*(x+90))) -1;

Combined_XValues = [x x2];
Combined_YValues = [y y2];

figure(2)
plot(Combined_XValues,Combined_YValues)
title('Voltage Reponse to Phase Changes')
xlabel('Phase Difference (Degrees)')
ylabel('Voltage (Volts)')
```


Published with MATLAB® R2016a