

# MatLab Export

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## Data

nSeries            Number of Series

## Values

Data                Cell array of length nSeries  
Data{i}             Data serie <i>  
                      2xM matrix containing values

## Example

Data{2}             Serie 2 values  
Data{2}(1,:)        Serie 2, all x values  
Data{2}(2,:)        Serie 2, all y values  
Data{2}(:,4)        Serie 2, coordinates of the 4<sup>th</sup> data point  
Data{2}(1,4)        Serie 2, x coordinate of the 4<sup>th</sup> data point  
Data{2}(2,4)        Serie 2, y coordinate of the 4<sup>th</sup> data point

## Text Variables

XName              x axis label  
YName              y axis label  
Title                Document title

## Spline Interpolation

A couple of examples how to use the spline interpolation for better curves. Caution: Spline tends to oscillate when points are following each other too close and/or have a too large y difference. Rather use fewer points.

## Examples

### Refine Curve

```
x = 0:0.01:10; % refined x vector  
y = spline(Data{2}(1,:), Data{2}(2,:), x); % new, refined y values
```

### Obtain a single interpolated value

```
y = spline(Data{2}(1,:), Data{2}(2,:), 0.3); % interpolate for value at 0.3
```

## Script

<b>Part 1</b>	<b>Data definition</b> String variables definition Color definition
<b>Part 2</b>	<b>Plot data</b> Plots the actual data points
<b>Part 3</b>	<b>Interpolation</b> Plots spline interpolated curves into a new figure. Compare the two figures to see if the interpolation is reasonable.

## MatLab Code from sample.rds

```
% Define Data
```

```
Data = { ...  
    [-0.954180444024563 -0.0838095703961277; ...  
      2.11200335905107 0.191639985607236; ...  
      4.43814622369181 0.431532370009477; ...  
      6.70865480501758 0.654515343916962; ...  
      9.72025402823702 0.915478644823572; ...  
      12.6237337952029 1.0383747653353; ...  
      15.7298063297119 1.07135074966464; ...  
      18.1126331811263 0.996022223161522; ...  
      18.1955597543694 0.62986237160685; ...  
      20.2204377263423 0.731898284779257]', ...  
    [-6.15126226840917 -0.0369267811739067; ...  
      -3.98887314333701 0.159506837938073; ...  
      -1.60604629192253 0.418731788233073; ...  
      0.624573557969874 0.661152682615838; ...  
      2.98115782291503 0.859798747960777; ...  
      6.64777200440875 1.07156145882969; ...  
      9.90185272660473 1.22316670307862; ...  
      13.5443237285467 1.2676790141941; ...  
      16.4446543851362 1.16027001731308; ...  
      17.5164016165433 0.846366038689241; ...  
      18.7770954705296 0.85711220610647]', ...  
    [-9.05054322153991 -0.0386124544942562; ...  
      -6.73594709494568 0.174625220529958; ...  
      -4.35731905736629 0.424157549232948; ...  
      -2.22432162913977 0.664260642800232; ...  
      0.901695271085918 0.966312230890362; ...  
      4.96194824961948 1.08309778561583; ...  
      8.0365296803653 1.26641475920384; ...  
      11.4701096940114 1.3863082741137; ...  
      14.430273447751 1.30550130931944]', ...  
    [-12.7706922794311 -0.150920439462543; ...  
      -11.3116044717367 -0.0167513786209733; ...  
      -8.62541332073689 0.162140702501119; ...  
      -6.14811315803286 0.416413987417592; ...  
      -3.80097622421666 0.704769479779882; ...  
      -1.80339054217184 0.966839003802971; ...  
      -0.284469637327455 1.12761009673131; ...  
      2.00913242009132 1.06934901259673; ...  
      4.81708917230882 1.19477364308898; ...  
      7.10439300897496 1.34500927776513; ...  
      10.1107437149005 1.48233897608236; ...  
      12.6531254920485 1.44077659327749; ...  
      14.4502178134677 1.35154126188149]', ...  
    [-10.4361517871201 -0.00316063747565535; ...  
      -8.16144439195927 0.229514958023839; ...  
      -5.97281268041778 0.48652746208588; ...  
      -4.01091691597124 0.777727528176259; ...  
      -2.15924001469585 1.03753192867513; ...  
      -0.617225633758463 1.25161244035952; ...  
      1.39400619325041 1.09911168215915; ...  
      3.12496719676691 1.19177103748711; ...  
      5.07216711279064 1.33752910240608; ...  
      7.85703038891513 1.52116213974166; ...  
      10.7395160867055 1.59559515229334; ...  
      13.1538340418832 1.48144346213092; ...  
      15.2238492625833 1.35312158061932]', ...  
    [-10.3899648349341 0.103458200036452; ...  
      -7.8234398782344 0.340664042584386; ...  
      -5.8867369967984 0.573708379122707; ...
```

```

-3.98992284679578 0.826190636136308; ...
-1.81493728021834 1.05170212002432; ...
1.22080512255288 1.14536234388624; ...
3.72014905789115 1.33900406656139; ...
5.91822810056159 1.50630714360608; ...
8.30630346926993 1.66613004529172; ...
11.1342045872041 1.61455897714727; ...
11.7482811105863 1.58237315218685]';
nSeries = length(Data);

% Define Labels
XName = 'alpha';
YName = 'c_a';
Title = 'Sample';
Series = {'beta = 0°', ...
          'beta = 10°', ...
          'beta = 15°', ...
          'beta = 20°', ...
          'beta = 25°', ...
          'beta = 30°'};

% Define Colors
Colors = {[1.0000 0.0000 0.0000], ...
          [0.0000 0.5020 1.0000], ...
          [0.0000 0.7529 0.0000], ...
          [0.9961 0.8784 0.0078], ...
          [0.5020 0.0000 1.0000], ...
          [1.0000 0.0000 0.5020]};

% Plot
figure;
for i = 1:nSeries
    Data_i = Data{i};
    plot(Data_i(1,:), Data_i(2,:), 'Color', Colors{i});
    hold on;
end
hold off;

legend(Series);
xlabel(XName);
ylabel(YName);
title(sprintf('\b{\b%s}', Title), 'FontSize', 12);

% Sample Spline Interpolation
% y = spline(Data{i}(1,:), Data{i}(2,:), x);
% i .. index of the series
% x .. single value or vector for desired values
%      e.g. x = 0.3 to evaluate at this point
%      or   x = 0:0.05:10 for refined data series.

% Save limits of previous plot for better comparison
xlim_prev = xlim;
ylim_prev = ylim;

figure;
for i = 1:nSeries
    % Sort in case the points have been gathered randomly
    Data_i = (sortrows((Data{i}'), 1))';

    % Refine x vector: 10 times as much points
    n = size(Data_i, 2) * 10;

```

```

x_1 = Data_i(1,1);
x_end = Data_i(1,end);
x = x_1:(x_end-x_1)/(n-1):x_end;

% Interpolate y vector accordinly
y = spline(Data_i(1,:), Data_i(2,:), x);

% Plot series
plot(x, y, 'Color', Colors{i});
hold on;
end
hold off;

legend(Series);
xlabel(XName);
ylabel(YName);
title(sprintf('\bf{%s (Interpolated)}', Title), 'FontSize', 12);
xlim(xlim_prev);
ylim(ylim_prev);

```