

Lab 6

Cubic spline interpolation

Use Matlab functions *csape*, *fnval*.

1. Consider the function: $f(x) = \sin(x)$ defined on $[0, 2\pi]$ and the nodes $0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$.
 - (a) display the value of the function, the value of the cubic natural spline and the value of cubic clamped spline function at $x = \frac{\pi}{4}$.
 - (b) plot the graphs of the function, the cubic natural spline and the cubic clamped spline function, in the same figure.
2. There are given 5 arbitrary points, using Matlab function *ginput*. Plot the points and the graph of cubic natural spline function that passes through all the given points.

Least squares approximation

Use Matlab functions *polyfit*, *polyval*.

1. The vapor pressure P of the water (in bars) as a function of temperature T (in $^{\circ}C$) is:

T	0	10	20	30	40	60	80	100
P	0.0061	0.0123	0.0234	0.0424	0.0738	0.1992	0.4736	1.0133

- (a) Obtain the best linear least squares polynomial and use it to approximate the pressure P at $T = 45^{\circ}$.
- (b) Obtain other two least squares approximations for the given data, for 2 different degrees of the polynomials. Find their values for $T = 45^{\circ}$.
- (c) Compute in all three cases the approximation errors, knowing that the exact value is $P(45) = 0.095848$.
- (d) Plot the interpolation points, the 3 least squares approximants and the interpolation polynomial, in the same figure.