Answers to HW Set #3

3.1 See figure 3.8 from the book.
3.2 See figure 3.10 from the book.
3.3 (a) See figure 3.1.
(b) Values at -0.3:
piecelin and pchip follow overall trend of data.
plin = 0.4300
poly = -0.9990
spl = -0.1957
pch = 0.4322
(c)
```
V = vander(x);
c = V\y
c = round(c)
p = poly2sym(c')
p =
16*x^5-20*x^3+5*x
```
The data comes from the Chebyshev polynomial $T_5(x)$. In an sense, the value from polyinterp is the "correct" result.

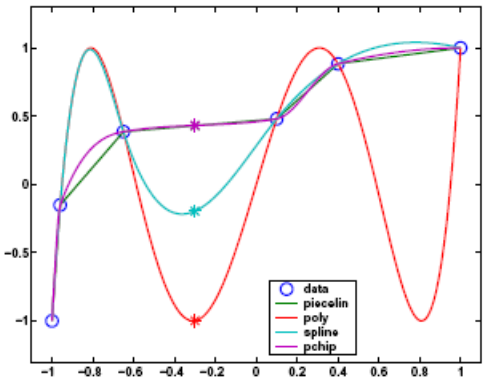
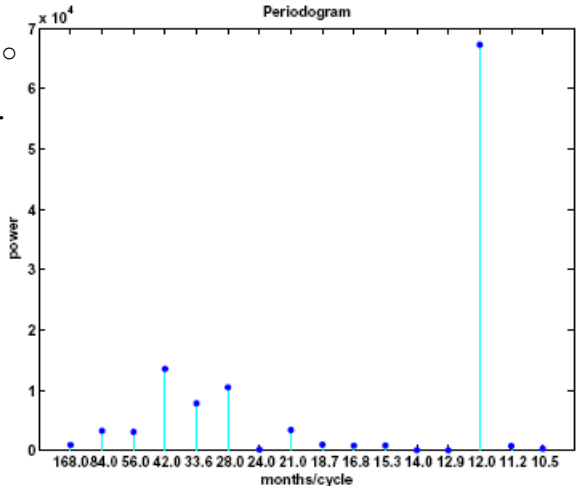
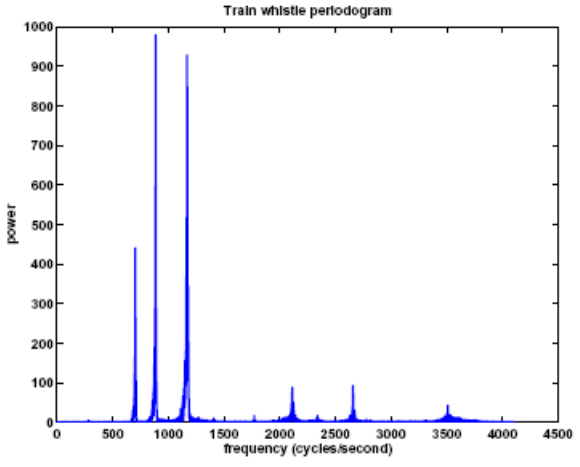


Figure 3.1. *Deceptive data for interpolation*

3.11. Change the first line of both splinetx and pchiptx.
```
function [v,p] = pchiptx(x,y,u)
```
Add this line to the help entries.
```
% [v,p] = pchip(x,y,u) also returns p(k) = P'(u(k)).
```
Add this line to the main functions.
```
p = d(k) + s.*(2*c(k) + 3*s.*b(k));
```
3.16. (a) interpgui(1-x.^2). For a second degree polynomial, spline and polyinterp produce the same curve.
(b) interpgui(1-x.^4) None of the plots overlap, although polyinterp and spline are within 10^{-3}, so they look like they overlap.
3.18 (a) The Vandermonde matrix is very badly conditioned.
cond(vander(1900:10:2000)) = 3.0562e+48
(b) What does the check box about centering and scaling do? The check box replaces x by (x - mean(x))/std(x).
(c) The function F(s) = condest(vander((-50:10:50)/s)) is minimized at s = 42.6 where F(s) = 1.3e4.
sigma = std(-50:10:50) = 33.17 and F(sigma) = 3.3e4.
So sigma is not the optimum scaling, but it's not too bad.
8.1. The telephone number in touchtone is 1-508-647-7001.
8.7 The strongest peak is at 12 months per cycle, i.e. yearly. There is another peak spread across three Components with 28, 33.6, and 42 months per cycle, i.e. a little less than three years.



8.8. The frequencies (in Hz.) of the peaks, and the ratios to the first peak, are
700 1
875 5/4
1167 5/3
2100 3
2625 15/4
3500 5
The first three peaks are fundamental tones. The fourth and sixth peaks are the first two overtones of the first fundamental tone. The fifth peak is the first overtone of the second fundamental tone.



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