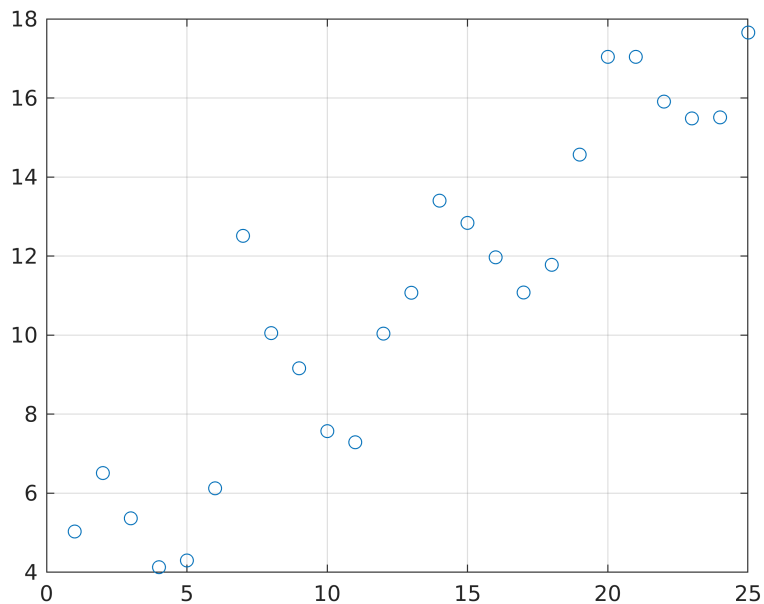


# Exercise 5 Data fitting with outlier and sinusoid

File:Exercise5\_DatafitOutlier\_sinusoid.m

HA 4.12.2018

```
clear; close all; format compact
t = 1:25;
y = [ 5.0291  6.5099  5.3666  4.1272  4.2948 ...
      6.1261 12.5140 10.0502  9.1614  7.5677 ...
      7.2920 10.0357 11.0708 13.4045 12.8415 ...
      11.9666 11.0765 11.7774 14.5701 17.0440 ...
      17.0398 15.9069 15.4850 15.5112 17.6572];
figure(1)
plot(t,y,'o');grid on
```



## Fit an LSQ-line

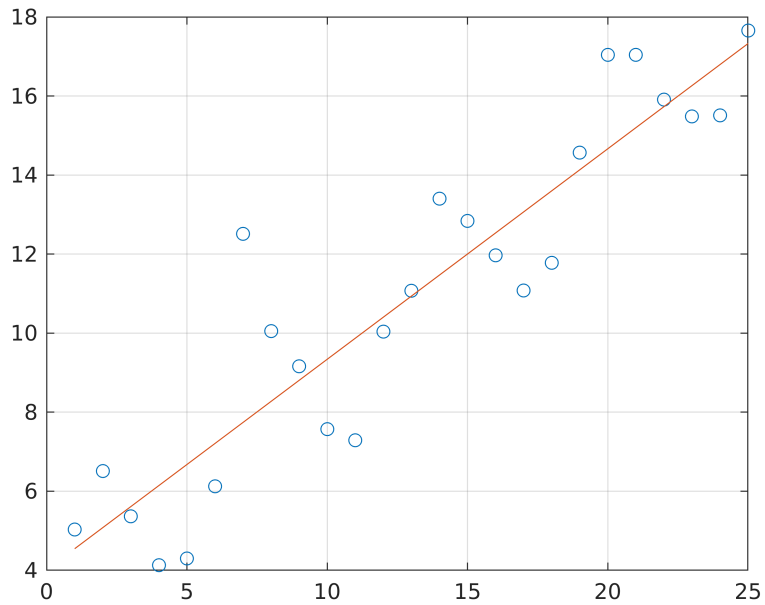
Can be done using `*polyfit*`, `*polyval*` as in Exercise 2.  
Let's do it this time in a way that can be easily generalized  
to a non-polynomial case.

### Lectures on Curve Fitting

```
t = t';
y = y';
A = [ones(size(t)) t]; % Vandermonde matrix for fitting an LSQ-line
```

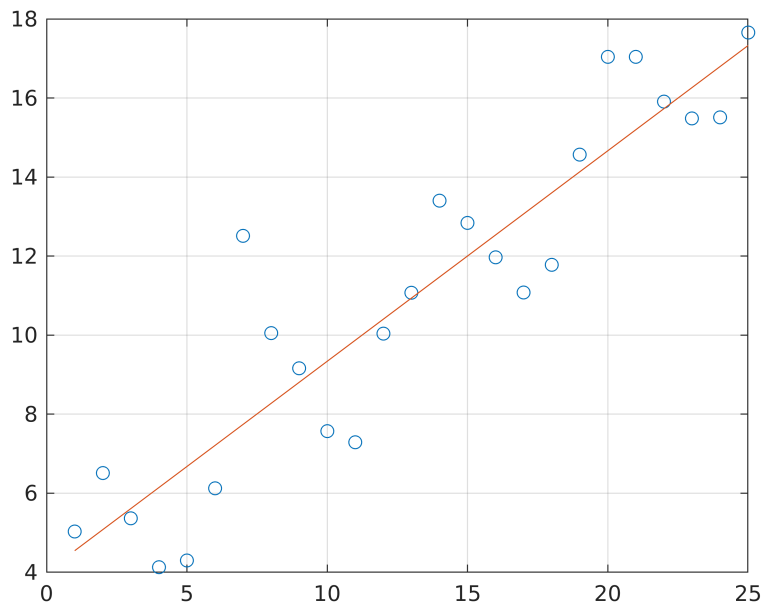
```
c = A\y; % coeffs of poly
```

```
f = A*c; %  
hold on  
plot(t,f);shg
```



## The same with polyfit:

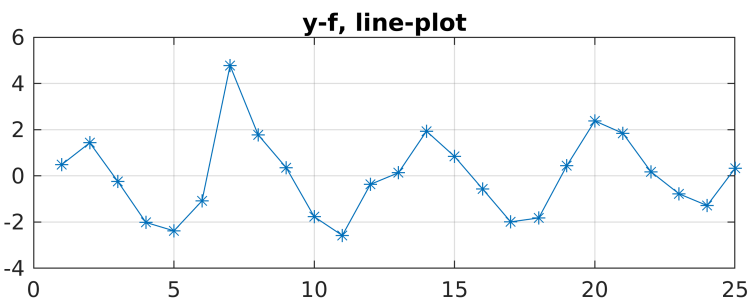
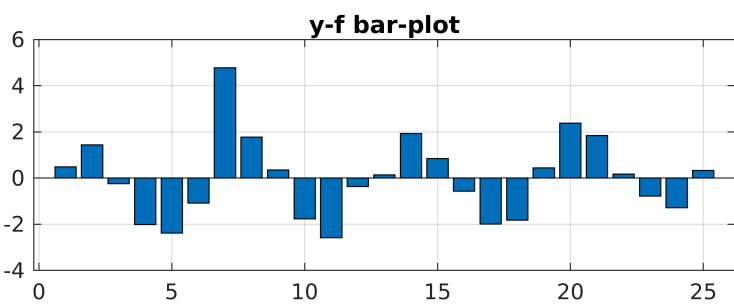
```
C=polyfit(t,y,1);  
F=polyval(C,t);  
figure  
plot(t,y,'o',t,F);grid on
```



```

figure(2)
clf
subplot(2,1,1)
bar(t,y-f);
title('y-f bar-plot')
grid on
subplot(2,1,2)
plot(t,y-f,'-*')
grid on
title('y-f, line-plot')

```

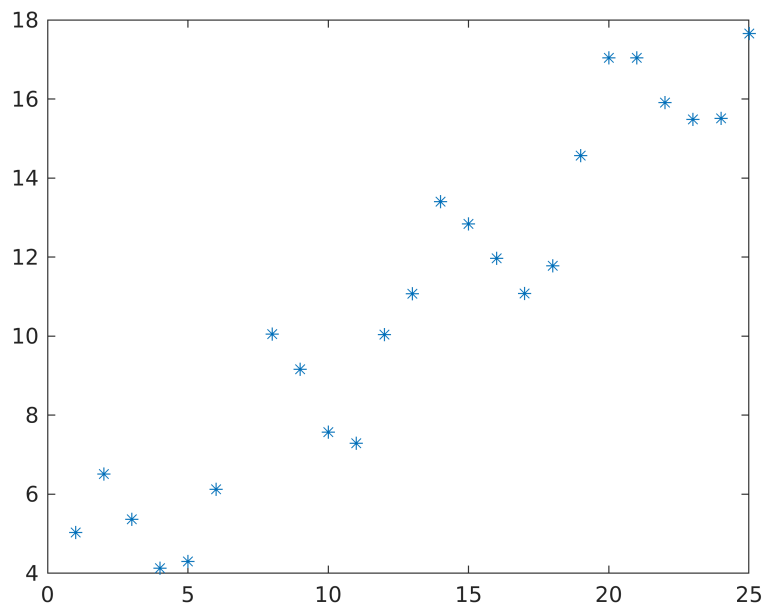


```
disp('(t(7),y(7)) is the outlier')
```

```
(t(7),y(7)) is the outlier
```

## Data with outlier removed

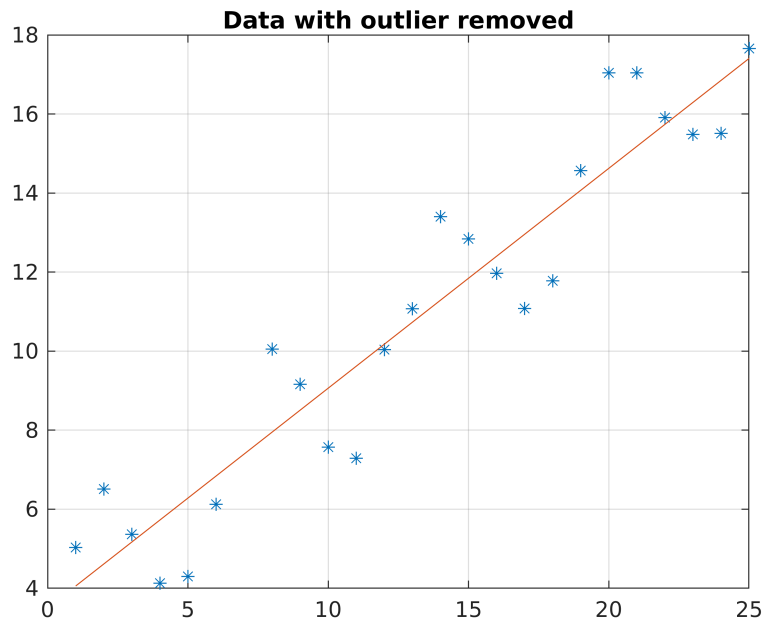
```
clf % Clear Graphics  
t7 = t(7);  
y7 = y(7);  
t(7) = []; % Remove t(7) NOTE HOW NICE!  
y(7) = []; % ... and y(7)  
plot(t,y,'*')
```



```
shg
```

## Fit LSQ-line to data with outlier removed

```
A = [ones(size(t)) t];  
c=A\y;  
f1=A*c;  
hold on  
plot(t,f1);title('Data with outlier removed');grid on;shg
```



```
%
% Looks like sinusoidal "disturbance" of straight line.
```

## Try sinusoidal fit

Instead of monomials, our basis functions are:  $1, t, \sin t$  The modified Vandemone is then:

```
A = [ones(size(t)) t sin(t)]; % (t.^2 is replaced by sin(t))
c = A\y;
```

```
s = (0:.1:26)'; % Evaluation points (Not the same as datapoints)
f = [ones(size(s)) s sin(s)]*c;
figure(3)
plot(t,y,'o',s,f,'-',t7,y7,'*')
axis tight; grid on
title('Sinusoidal fit to data with outlier removed')
legend('Data', 'fit', 'outlier', 'Location', 'NW')
```

