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연습문제 15-3

```
function p = polyreg(x,y,m)
n = length(x);
if length(y)~=n, error('x and y must be same length'); end
for i = 1:m+1
for j = 1:i
k = i+j-2;
s = 0;
for l = 1:n
s = s + x(l)^k;
end
A(i,j) = s;
A(j,i) = s;
end
s = 0;
for l = 1:n
s = s + y(l)*x(l)^(i-1);
end
b(i) = s;
end
p = A\b';
```

```
>> x = [3 4 5 7 8 9 11 12];
>> y = [1.6 3.6 4.4 3.4 2.2 2.8 3.8 4.6];
>> polyreg(x,y,3)
ans =

  -11.489
  7.1438
  -1.0412
  0.046676
```

연습문제 15-9

```
>> clear
>> D = [.3 .6 .9 .3 .6 .9 .3 .6 .9]';
>> S = [.001 .001 .001 .01 .01 .01 .05 .05 .05]';
>> Q = [.04 .24 .69 .13 .82 2.38 .31 1.95 5.66]';
>> o = [1 1 1 1 1 1 1 1 1]';
>> Z = [o log10(D) log10(S)]
Z =

  1  -0.52288  -3
  1  -0.22185  -3
  1  -0.045757  -3
  1  -0.52288  -2
  1  -0.22185  -2
  1  -0.045757  -2
  1  -0.52288  -1.301
  1  -0.22185  -1.301
  1  -0.045757  -1.301

>> a = (Z'*Z)\[Z'*log10(Q)]
a =

  1.5609
  2.6279
  0.53199
```

결과 적으론 $Q = 10^{1.5609} D^{2.6279} S^{0.5320} = 36.3813 D^{2.6279} S^{0.5320}$

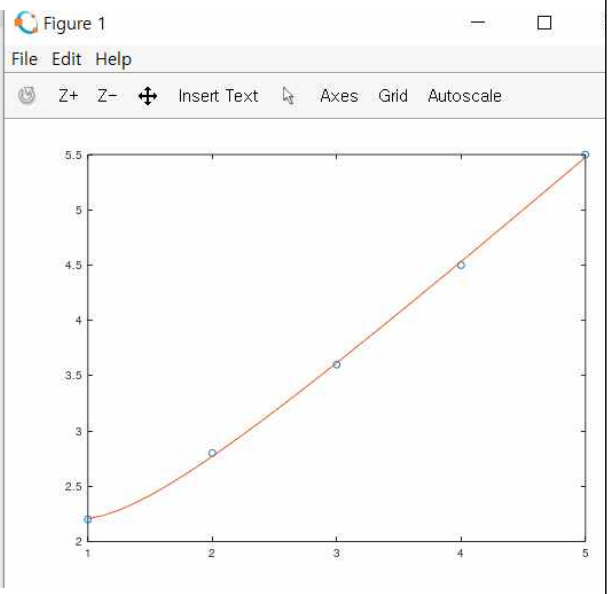
연습문제 15-9

Command Window

```
>> x =[1 2 3 4 5]';
>> y =[2.2 2.8 3.6 4.5 5.5]';
>> Z = [ones(size(x)) x 1./x];
>> a = (Z'*Z)\(Z'*y)
a =

   0.3745
   0.98644
   0.84564

>> Sr = sum((y-Z*a).^2)
Sr = 0.0027651
>> r2 = 1-Sr/sum((y-mean(y)).^2)
r2 = 0.9996
>> syx = sqrt(Sr/(length(x)-length(a)))
syx = 0.037183
>> clf
>> xp=[1:0.125:5];
>> yp=a(1)+a(2)*xp+a(3)./xp;
>> plot(x,y,'o',xp,yp)
>> xlim([0 6]),ylim([0 6])
```




```
a =

   0.3745
   0.98644
   0.84564

>> Sr
Sr = 0.0027651
>> r2
r2 = 0.9996
>> syx
syx = 0.037183
>> y
y =

   2.2
   2.8
   3.6
   4.5
   5.5
```

$$y = 0.3745 + 0.98644x + \frac{0.84564}{x}$$

EXAMPLE 15.2

예제 15.2

$$\begin{bmatrix} 6 & 16.5 & 14 \\ 16.5 & 76.25 & 48 \\ 14 & 48 & 54 \end{bmatrix} \begin{Bmatrix} a_0 \\ a_1 \\ a_2 \end{Bmatrix} = \begin{Bmatrix} 54 \\ 243.5 \\ 100 \end{Bmatrix}$$

따라서 $a_0 = 5$, $a_1 = 4$, $a_2 = -3$

EXAMPLE 15.3

```
>> x = [0 1 2 3 4 5]';
>> y = [2.1 7.7 13.6 27.2 40.9 661.1]';
>> z = [ones(size(x)) x x.^2]
z =

    1    0    0
    1    1    1
    1    2    4
    1    3    9
    1    4   16
    1    5   25

>> z' *z
ans =

     6    15    55
    15    55   225
    55   225   979

>> a = (z' *z)\(z' *y)
a =

    66.764
  -179.784
    55.432

>> Sr = sum((y-z*a)).^2)
parse error:

  syntax error

>>> Sr = sum((y-z*a)).^2)
                      ^

>> Sr = sum((y-z*a).^2)
Sr =  64658.03229
>> r2 = 1 - Sr/sum((y-mean(y)).^2)
r2 =  0.81276
>> syx = sqrt(Sr/(length(x)-length(a)))
syx =  146.81
```

EXAMPLE 15.4

```
>> x = [0 1 2 3 4 5]';
>> y = [2.1 7.7 13.6 27.2 40.9 61.1]';
>> z = [ones(size(x)) x x.^2]
z =

     1     0     0
     1     1     1
     1     2     4
     1     3     9
     1     4    16
     1     5    25

>> a = polyfit(x,y,2)
a =

    1.8607    2.3593    2.4786

>> a = z\y
a =

    2.4786
    2.3593
    1.8607
```

EXAMPLE 15.5

```
function f = fSSR(a,xm,ym)
   yp = a(1)*xm.^a(2);
   f = sum((ym-yp).^2);
```

```
>> x = [10 20 30 40 50 60 70 80];
>> y = [25 70 380 550 610 1220 830 1450];
>> fminsearch(@fSSR, [1,1], [], x, y)
ans =

    2.5384    1.4359
```

```
>> U = [0.5 2 10 0.5 2 10 0.5 2 10]';
>> H = [0.15 0.15 0.15 0.3 0.3 0.3 0.5 0.5 0.5]';
>> KL = [0.48 3.9 57 0.85 5 77 0.8 9 92]';
>> logU=log10(U);logH=log10(H);logKL=log10(KL);
>> Z = [ones(size(logKL))logU logH];
parse error:

  syntax error

>>> Z = [ones(size(logKL))logU logH];
                          ^

>> Z = [ones(size(logKL)) logU logH];
>> a = (Z' *Z)\(Z' *logKL)
a =

  0.57627
  1.562
  0.50742
```

```
>> Sr=sum((logKL-Z*a) .^2)
Sr = 0.024171
>> r2=1-Sr/sum((logKL - mean(logKL)) .^2)
r2 = 0.99619
>> syx=sqrt(Sr/(length(logKL)-length(a)))
syx = 0.063471
```

```
>> Sr=sum((logKL-Z*a). ^2)
parse error:

  syntax error

>>> Sr=sum((logKL-Z*a). ^2)
                     ^

>> Sr=sum((logKL-Z*a) .^2)
Sr = 0.024171
>> r2=1-Sr/sum((logKL - mean(logKL)) .^2)
r2 = 0.99619
>> syx=sqrt(Sr/(length(logKL)-length(a)))
syx = 0.063471
>> clf
>> KLpred = 10^a(1)*U.^a(2).*H.^a(3);
>> KLmin=min(KL);KLmax=max(KL);
>> dKL = (KLmax-KLmin)/100;
>> KLmod = [KLmin:KLmax];
>> subplot(1,2,1)
>> loglog(KLpred,KL,'ko'',KLmod,KLmod,'k-')
parse error:

  syntax error

>>> loglog(KLpred,KL,'ko'',KLmod,KLmod,'k-')
                                    ^

>> loglog(KLpred,KL,'ko',KLmod,KLmod,'k-')
>> axis square,title('(a) log-log plot')
```

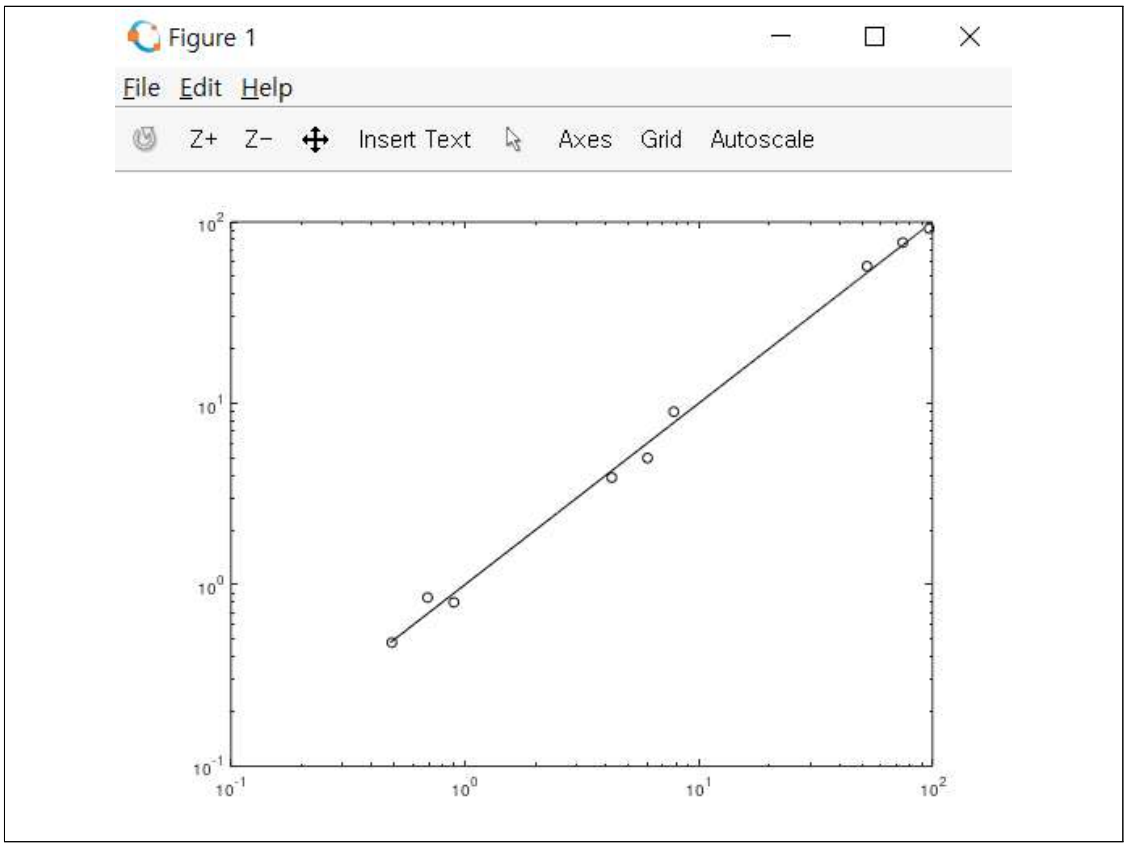


Figure 1
File Edit Help
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10^2
10^1
10^0
10^{-1}
10^{-1}
10^0
10^1
10^2