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M 340L-C March 12, 1998

Computer Assignment 6

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Chapter 6, section 1, problem 4: Computing a Least-Squares Line

Matlab Input:

```
x = [2.4 3.6 3.6 4.1 4.7 5.3]'
y = [33.8 34.7 35.5 36.0 37.5 38.1]'
A = [x, ones(size(x))]
c = A\y
t = 2:0.1:9;
z = polyval(c,t);
plot(x,y,'x',t,z)
```

Matlab Output:

```
x =
    2.4000
    3.6000
    3.6000
    4.1000
    4.7000
    5.3000
y =
   33.8000
   34.7000
   35.5000
   36.0000
   37.5000
   38.1000
A =
    2.4000    1.0000
    3.6000    1.0000
    3.6000    1.0000
    4.1000    1.0000
    4.7000    1.0000
    5.3000    1.0000
c =
    1.5826
   29.6821
```

ABOUT THE MATLAB COMMANDS

---

ones Create vector or matrix of all ones.

Synopsis (as used): `Y = ones(size(A))`

Y = ones(size(A)) is the same size as A and consists of all 1s.

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Synopsis:
X = A\B is the solution to the equation AX = B

---

polyval Polynomial evaluation.

Synopsis: `y = polyval(p,S)`

y = polyval(p,S), where p is a vector whose elements are the coefficients of a polynomial in descending powers, is the value of the polynomial evaluated at S. If S is a matrix or vector, the polynomial is evaluated at each of the elements.

---

plot Linear 2-D plot.

Synopsis (as used):
`plot(X1,Y1,'linetype1',X2,Y2,'linetype2',...)`

plot(X,Y) plots vector X versus vector Y. If X or Y is a matrix, then the vector is plotted versus the rows or columns of the matrix, whichever line up.

Various line types, plot symbols and colors can be obtained with plot(X,Y,'linetype') where linetype is a 1-, 2-, or 3-character string made from the following characters:

```
.   point          y  yellow
o   circle         m  magenta
x   x-mark         c  cyan
+   plus           r  red
*   star           g  green
-   solid line     b  blue
:   dotted line    w  white
-.  dashdot line   k  black
-  dashed line
```

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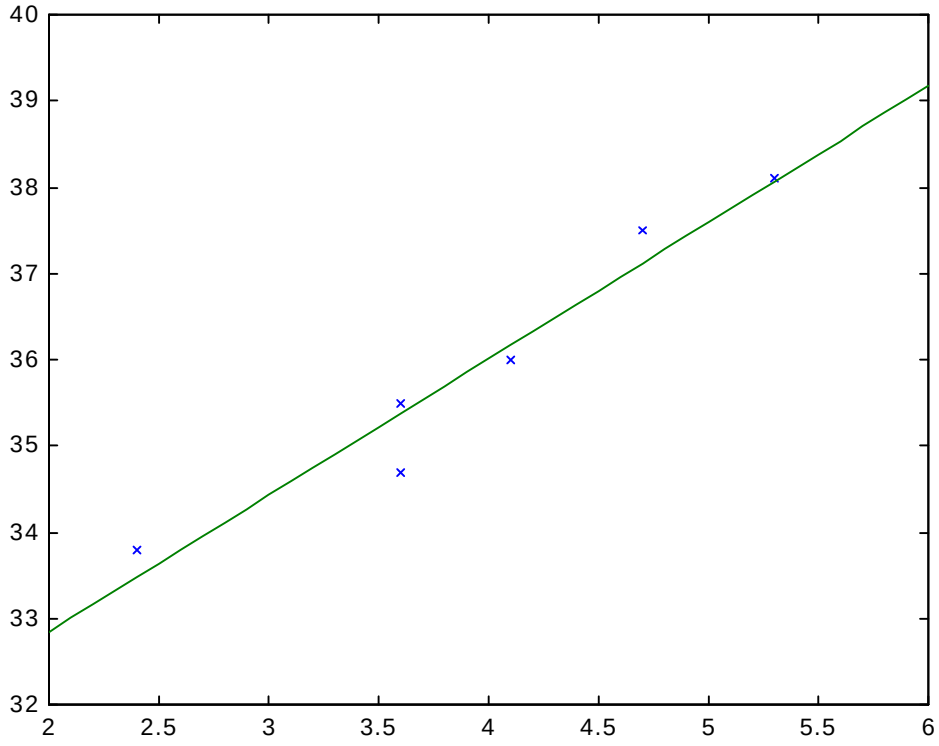

Matlab Input:

```
a = [2.4 3.6 3.6 4.1 4.7 5.3]'
x = [6.0 6.5 7.0 7.5 8.0 8.5]'
y = [33.8 34.7 35.5 36.0 37.5 38.1]'
A = [a, ones(size(x))]
c = A\y
t = 2:0.1:9;
z = polyval(c,t);
plot(x,y,'x',t,z)
```

Matlab Output:

```
a =
    2.4000
    3.6000
    3.6000
    4.1000
    4.7000
    5.3000
x =
    6.0000
    6.5000
    7.0000
    7.5000
    8.0000
    8.5000
y =
   33.8000
   34.7000
   35.5000
   36.0000
   37.5000
   38.1000
A =
    2.4000    1.0000
    3.6000    1.0000
    3.6000    1.0000
    4.1000    1.0000
    4.7000    1.0000
    5.3000    1.0000
c =
    1.5826
   29.6821
```

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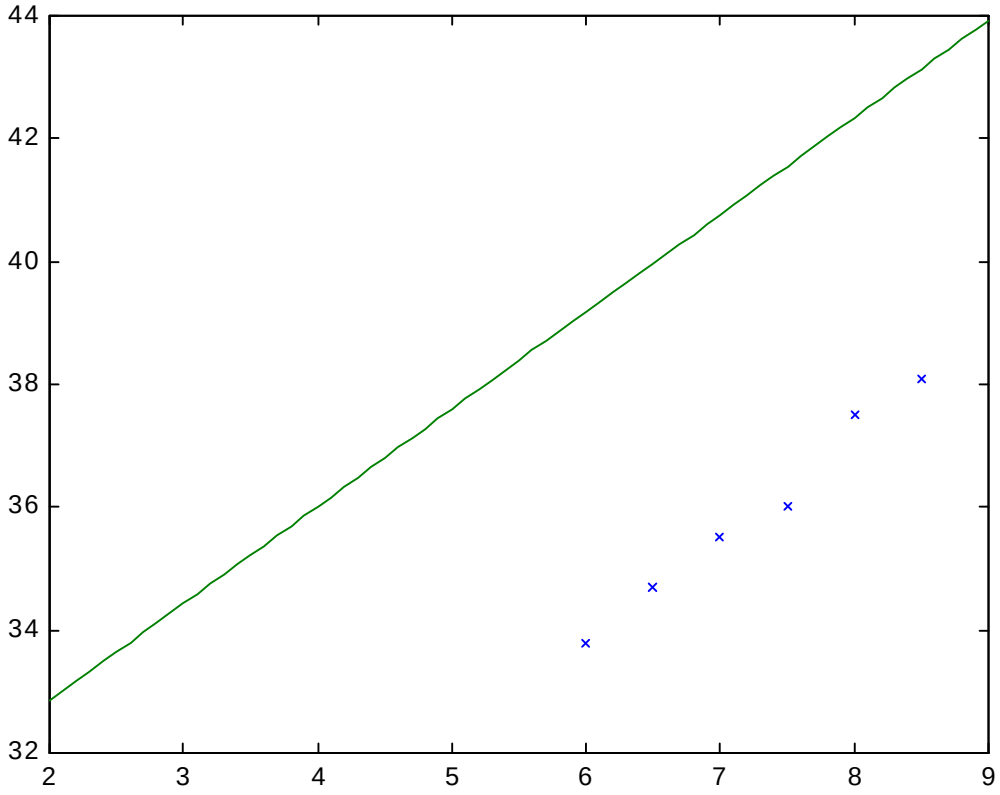

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Chapter 6, section 1, problem 5: Computing a Least-Squares Polynomial

Matlab Input:

```
x = [2.4 3.6 3.6 4.1 4.7 5.3 6.0 6.5 7.0 7.5 8.0 8.5]'
y = [33.8 34.7 35.5 36.0 37.5 38.1 38.6 38.7 38.5 37.6 37.2 36.4]'
plot(x,y,'x')
A = [x.^2, x, ones(size(x))]
c = A\y
t = 2:0.1:9;
z = polyval(c,t);
plot(x,y,'x',t,z)
p = polyder(c)
peak = roots(p)
```

Matlab Output:

```
x =
    2.4000
    3.6000
    3.6000
    4.1000
    4.7000
    5.3000
    6.0000
    6.5000
    7.0000
    7.5000
    8.0000
    8.5000
y =
   33.8000
   34.7000
   35.5000
   36.0000
   37.5000
   38.1000
   38.6000
   38.7000
   38.5000
   37.6000
   37.2000
   36.4000
A =
    5.7600    2.4000    1.0000
   12.9600    3.6000    1.0000
   12.9600    3.6000    1.0000
   16.8100    4.1000    1.0000
   22.0900    4.7000    1.0000
   28.0900    5.3000    1.0000
   36.0000    6.0000    1.0000
   42.2500    6.5000    1.0000
   49.0000    7.0000    1.0000
   56.2500    7.5000    1.0000
   64.0000    8.0000    1.0000
   72.2500    8.5000    1.0000
c =
   -0.3420
    4.3353
   24.5317
p =
   -0.6840    4.3353
peak =
    6.3376
```

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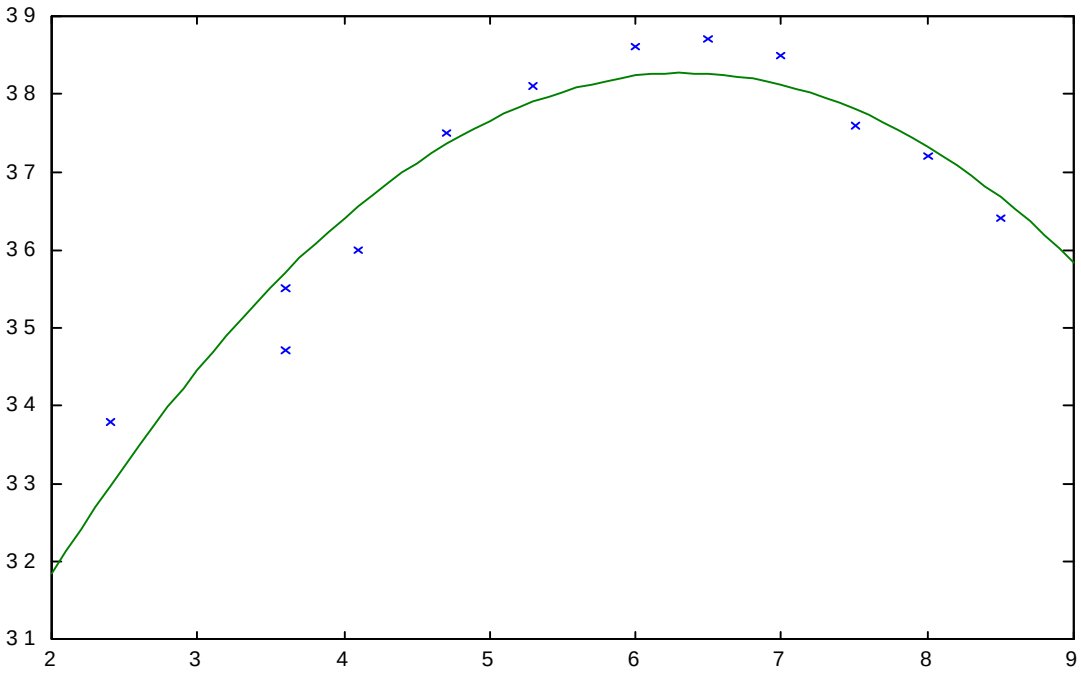

ABOUT THE MATLAB COMMANDS

---

roots Polynomial roots.

Synopsis: `r = roots(p)`

Polynomial coefficients are ordered in descending powers. If c is a row vector containing the coefficients of a polynomial, roots(c) is a column vector whose elements are the roots of the polynomial.

If r is a column vector containing the roots of a polynomial, poly(r) returns a row vector whose elements are the coefficients of the polynomial.

---

polyder Polynomial derivative.

Synopsis:

```
k = polyder(p)
k = polyder(a,b)
[q,d] = polyder(b,a)
```

`k = polyder(p)`, where p is a vector whose elements are the coefficients of a polynomial in descending powers, returns the derivative of that polynomial. k is a vector containing the coefficients of the derivative in descending powers.

`k = polyder(a,b)` returns the derivative of the product of the polynomials a and b.

`[q,d] = polyder(b,a)` returns the derivative of the polynomial quotient b/a, where the derivative is represented by q/d.