

Polynomials, roots, value

Let $p = x^4 - 15x^2 + 45x - 36$. Matlab represents the polynomial as the vector of coefficients starting at the highest power:

```
>> c=[1 0 -15 45 -36]; %Note: 0 for a missing power
>> pzeros=roots(c)
pzeros =
   -5.0355 + 0.0000i   % Real root
    1.8680 + 1.4184i   % complex conjugate roots
    1.8680 - 1.4184i   % (always with real polynomial)
    1.2996 + 0.0000i   % Real root
```

Note: One is tempted to use variable names such as `roots` or `zeros`. Both are names of Matlab's built-in functions (we just used `roots`). Check: `>> which roots >> which zeros`. Using such names may lead to “nonsense” error messages.

Polynomials, roots, value (continued)

To check how close to zero the values of the polynomial are at the computed zeros, we need the function `polyval`. Data for plotting will also be created at once.

```
>> polyval(c,pzeros) % Values of p at pzeros
ans =
    1.0e-11 *          % Small enough
    0.1300 + 0.0000i
   -0.0043 - 0.0046i
   -0.0043 + 0.0046i
    0.0000 + 0.0000i
>> x=linspace(-6,6); % 100 equally spaced points ...
    on the interval [-6,6].
>> y=polyval(c,x);
>> plot(x,y)
```