PolyEval.m

```
function p = PolyEval( n, a, y, x )
    b(n+1) = a(n+1);
    for i = n:-1:1
        b(i) = a(i) + b(i+1)*(x+y(i));
    end
    p = b(1);
end
```

ommand Window

ew to MATLAB? See resources for Getting Started.

```
>> clear
>> clear
>> a = [-1 0 2.33 -1.2 2.2];
>> y = [-1 1 -2 2];
>> PolyEval(4,a,y,1.234)

ans =

   -2.1504
```

```
>> r = [1 1 1 1 1 1 1 1];
>> p = poly(r)

p =

  Columns 1 through 8

     1    -8    28   -56    70   -56    28    -8

  Column 9

     1

>> roots(p)

ans =

   1.0180 + 0.0000i
   1.0125 + 0.0128i
   1.0125 - 0.0128i
   0.9997 + 0.0177i
   0.9997 - 0.0177i
   0.9875 + 0.0122i
   0.9875 - 0.0122i
   0.9826 + 0.0000i

>> q = p;
>> q(6) = q(6) + 0.001

q =

    1.0000   -8.0000   28.0000  -56.0000   70.0000  -55.9990   28.0000   -8.0000    1.0000
```

```
>> roots(q)

ans =

   1.4374 + 0.2097i
   1.4374 - 0.2097i
   1.1126 + 0.4366i
   1.1126 - 0.4366i
   0.7931 + 0.3413i
   0.7931 - 0.3413i
   0.6569 + 0.1164i
   0.6569 - 0.1164i

>> polyval( q, ans(1) )

ans =

  -6.2839e-14 - 6.6613e-16i
```

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4. $\left(\begin{array}{cccc|c} -2 & 0 & 2 & 4 & 4 \\ 1 & 1 & -2 & -2 & -7 \\ 0 & 3 & -1 & -3 & -9 \\ 4 & -2 & -1 & -9 & 5 \end{array}\right)$

$\rightarrow \left(\begin{array}{cccc|c} 1 & 0 & -1 & -2 & -2 \\ 1 & 1 & -2 & -2 & -7 \\ 0 & 3 & -1 & -3 & -9 \\ 4 & -2 & -1 & -9 & 5 \end{array}\right) \rightarrow \left(\begin{array}{cccc|c} 1 & 0 & -1 & -2 & -2 \\ 0 & 1 & -1 & 0 & -5 \\ 0 & 3 & -1 & -3 & -9 \\ 0 & -2 & 3 & -1 & 13 \end{array}\right) \rightarrow \left(\begin{array}{cccc|c} 1 & 0 & -1 & -2 & -2 \\ 0 & 1 & -1 & 0 & -5 \\ 0 & 0 & 2 & -3 & 6 \\ 0 & 0 & 1 & -1 & 3 \end{array}\right)$

$\rightarrow \left(\begin{array}{cccc|c} 1 & 0 & -1 & -2 & -2 \\ 0 & 1 & -1 & 0 & -5 \\ 0 & 0 & 1 & -1.5 & 3 \\ 0 & 0 & 1 & -1 & 3 \end{array}\right) \rightarrow \left(\begin{array}{cccc|c} 1 & 0 & -1 & -2 & -2 \\ 0 & 1 & -1 & 0 & -5 \\ 0 & 0 & 1 & -1.5 & 3 \\ 0 & 0 & 0 & 0.5 & 0 \end{array}\right)$

$0.5x_4 = 0$ $x_3 - 1.5x_4 = 3$ $x_2 - x_3 = -5$ $x_1 - x_3 - 2x_4 = -2$

$x_4 = 0$ $\Rightarrow x_3 = 3$ $x_2 = -2$ $\Rightarrow x_1 = 1$

$\therefore$ Ans $\Rightarrow x_1 = 1$
$x_2 = -2$
$x_3 = 3$
$x_4 = 0$

---

3 $Ax = b$

$\rightarrow \begin{bmatrix} 1.5 & 2 \\ -1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$ $\Rightarrow$ $1.5x_1 + 2x_2 = 1$ $\quad -x_1 - 2x_2 = -2$

$\rightarrow x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 3 \\ -2 \end{bmatrix}$ $\quad -1x_1 - 2x_2 = -2$ $\quad -2 - 2x_2 = -2$

$0.5x_1 = -1$ $\quad x_2 = 0$

$\Rightarrow x_1 = -2$

$\hat{x} = \begin{bmatrix} \hat{x}_1 \\ \hat{x}_2 \end{bmatrix} = A^{-1} \begin{bmatrix} \cdot \\ \cdot \end{bmatrix}$

$= \begin{bmatrix} -4 & 2 \\ -1 & 1.5 \end{bmatrix} \begin{bmatrix} 1+e_1 \\ -2+e_2 \end{bmatrix}$

$= \begin{bmatrix} 2 + 2e_1 - 4 + 2e_2 \\ -1 - e_1 + 3 - 1.5e_2 \end{bmatrix}$ Value doesn't change much, hence well conditioned.

$\hat{x} \rightarrow \begin{bmatrix} -2 + 2(e_1 + e_2) \\ 2 - 1.5(\frac{2}{3}e_1 + e_2) \end{bmatrix}$