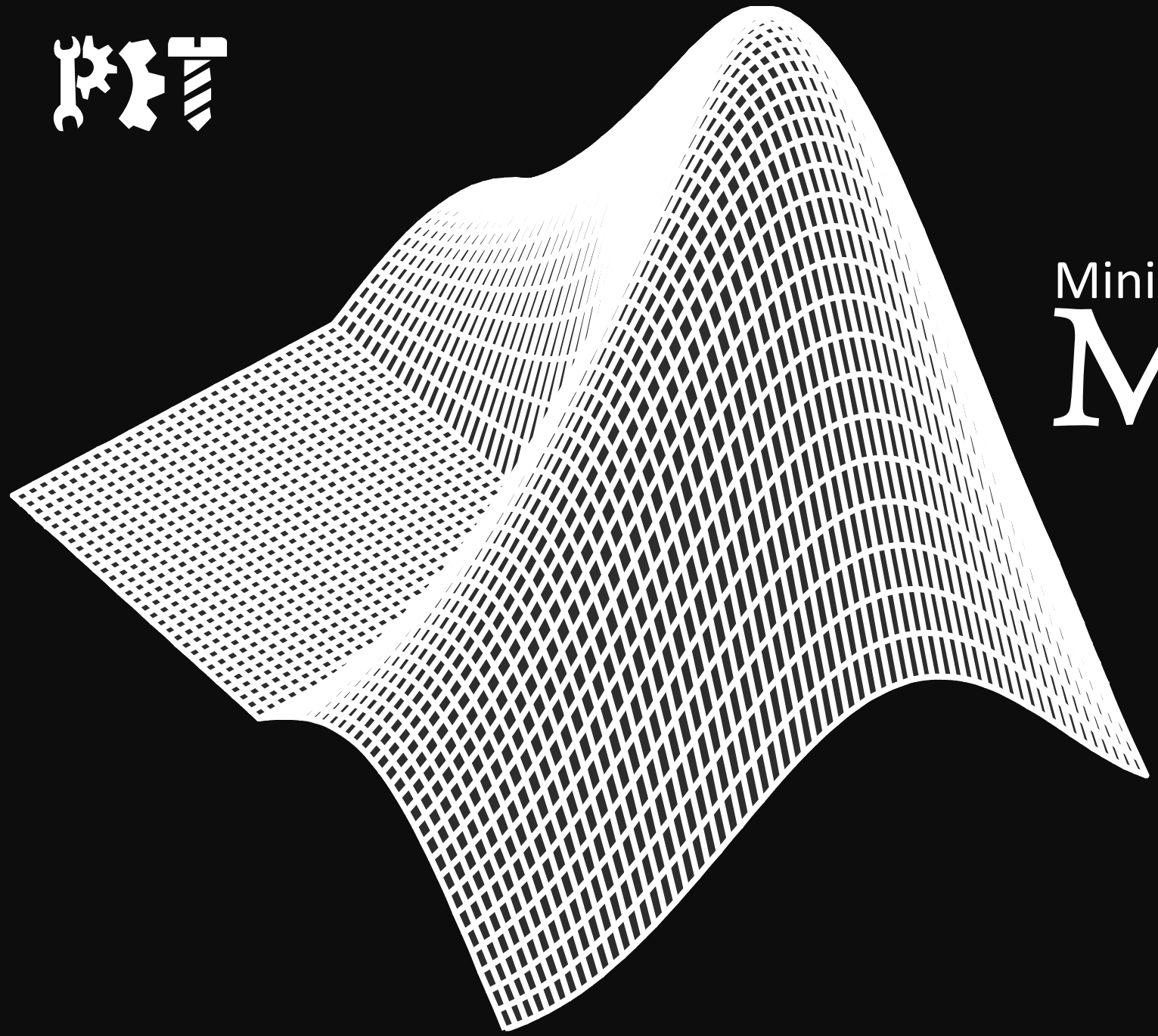


Minicurso

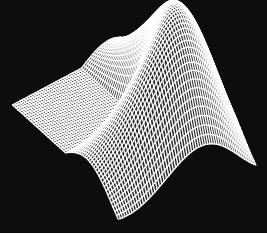
MATLAB

BÁSICO

MÓDULO 2

Roteiro do segundo módulo

- Matrizes
- Vetores
- Polinômios

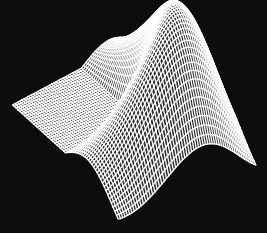


Matrizes e Vetores – Matrizes

→ Escrevendo uma matriz

```
M = [1 2 3; 4 5 6; 7 8 9]
```

```
M =

     1     2     3

     4     5     6

     7     8     9
```

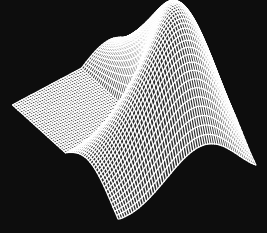


Matrizes e Vetores – Vetores

→ Vetor gerado por incremento

```
v = 1:5
```

```
v =

     1     2     3     4     5
```

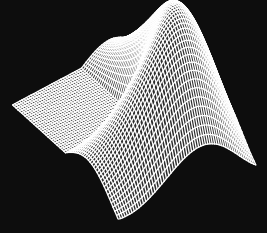


Matrizes e Vetores – Vetores

→ Vetor gerado por incremento

```
v = 1:2:10
```

```
v =

     1     3     5     7     9
```

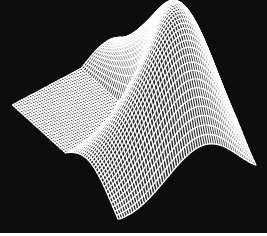


Matrizes e Vetores – Vetores

→ Vetor gerado por incremento

```
v = linspace(início, fim, quantidade)
```

```
>> v=linspace(2,6,10)

v =

    2.0000    2.4444    2.8889    3.3333    3.7778    4.2222
4.6667    5.1111    5.5556    6.0000
```

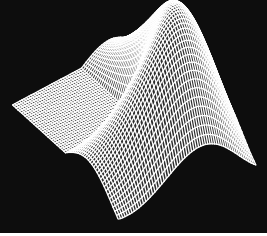


Matrizes e Vetores – Matrizes

→ Matriz randômica

```
rand(n°deLinhas,n°deColunas)
```

```
rand(2,3)

ans =

    0.8147    0.1270    0.6324
    0.9058    0.9134    0.0975
```

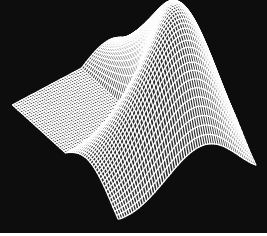


Matrizes e Vetores – Matrizes

→ Matriz quadrada mágica

`magic(dimensão)`

```
>> magic(5)

ans =

    17    24     1     8    15
    23     5     7    14    16
     4     6    13    20    22
    10    12    19    21     3
    11    18    25     2     9
```



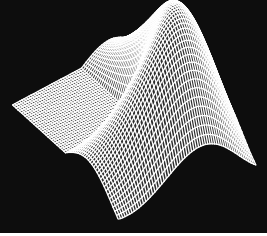
Matrizes e Vetores – Matrizes

→ zeros, ones, eye

```
>> zeros(2,3)

ans =

     0     0     0
     0     0     0
```

```
>> ones(3,4)

ans =

     1     1     1     1
     1     1     1     1
     1     1     1     1
```

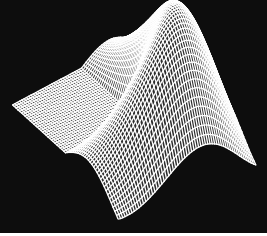
```
>> eye(4)

ans =

     1     0     0     0
     0     1     0     0
     0     0     1     0
     0     0     0     1
```



Matrizes e Vetores – Matrizes

→ pascal

```
>> pascal(5)

ans =

     1     1     1     1     1
     1     2     3     4     5
     1     3     6    10    15
     1     4    10    20    35
     1     5    15    35    70
```

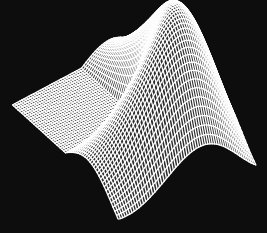


Matrizes e Vetores – Operações

→ Adição (A+B)

→ Subtração (A-B)

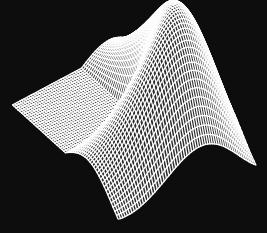
→ Multiplicação A*B???



Matrizes e Vetores – Solução de sist. linear

→ A\b

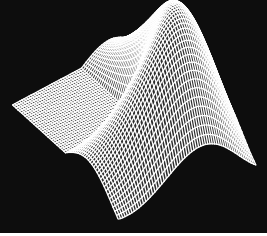
```
>> A=[2 3 5; 1 5 7; 1 1 1];
>> b=[2;4;7];
>> A\b

ans =

    4.0000
   10.5000
   -7.5000
```



Matrizes e Vetores – Solução de sist. linear

→ A\b

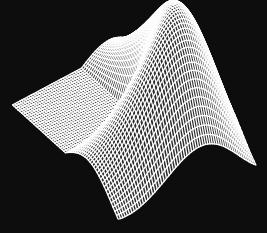
```
>> A=[2 3 5; 1 5 7; 1 1 1];
>> b=[2;4;7];
>> A\b

ans =

    4.0000
   10.5000
   -7.5000
```



Matrizes e Vetores – Transposta

→ A’

```
>> A=[2 3 5; 1 5 7; 1 1 1];
>> A'

ans =

     2     1     1
     3     5     1
     5     7     1
```



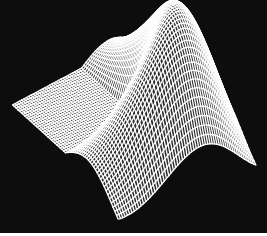
Matrizes e Vetores – Op. Elemento a elemento

→ A*A x A.*A

```
A =

     2     3     5
     1     5     7
     1     1     1
```

```
>> A*A

ans =

    12    26    36
    14    35    47
     4     9    13
```

```
>> A.*A

ans =

     4     9    25
     1    25    49
     1     1     1
```



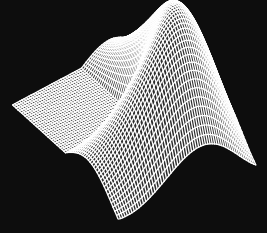
Matrizes e Vetores – Op. Elemento a elemento

→ A^2 x A.^2

```
A =

     2     3     5
     1     5     7
     1     1     1
```

```
>> A^2

ans =

    12    26    36
    14    35    47
     4     9    13
```

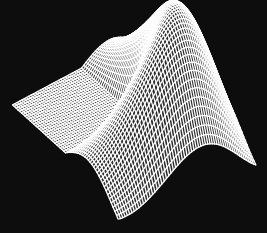
```
>> A.^2

ans =

     4     9    25
     1    25    49
     1     1     1
```



Matrizes e Vetores – Termos

→ Considere

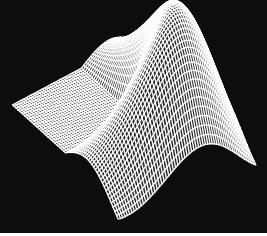
```
>> B=rand(10)

B =

    0.7577    0.8235    0.4898    0.4984    0.9593    0.3500    0.2858    0.1299    0.6020    0.8258
    0.7431    0.6948    0.4456    0.9597    0.5472    0.1966    0.7572    0.5688    0.2630    0.5383
    0.3922    0.3171    0.6463    0.3404    0.1386    0.2511    0.7537    0.4694    0.6541    0.9961
    0.6555    0.9502    0.7094    0.5853    0.1493    0.6160    0.3804    0.0119    0.6892    0.0782
    0.1712    0.0344    0.7547    0.2238    0.2575    0.4733    0.5678    0.3371    0.7482    0.4427
    0.7060    0.4387    0.2760    0.7513    0.8407    0.3517    0.0759    0.1622    0.4505    0.1067
    0.0318    0.3816    0.6797    0.2551    0.2543    0.8308    0.0540    0.7943    0.0838    0.9619
    0.2769    0.7655    0.6551    0.5060    0.8143    0.5853    0.5308    0.3112    0.2290    0.0046
    0.0462    0.7952    0.1626    0.6991    0.2435    0.5497    0.7792    0.5285    0.9133    0.7749
    0.0971    0.1869    0.1190    0.8909    0.9293    0.9172    0.9340    0.1656    0.1524    0.8173
```



Matrizes e Vetores – Termos

→ Então

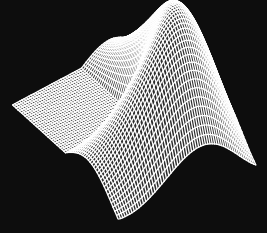
```
>> B(1,2)

ans =

    0.8235
```



Matrizes e Vetores – Termos

→ Então

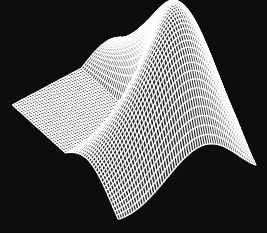
```
>> B(3,:)

ans =

    0.3922    0.3171    0.6463    0.3404    0.1386    0.2511    0.7537
0.4694    0.6541    0.9961
```



Matrizes e Vetores – Termos

→ Então

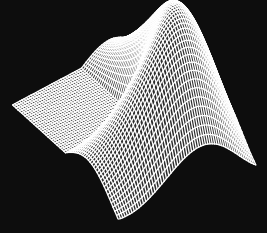
```
>> B(:,3)

ans =

    0.4898
    0.4456
    0.6463
    0.7094
    0.7547
    0.2760
    0.6797
    0.6551
    0.1626
    0.1190
```



Matrizes e Vetores – Termos

→ Então

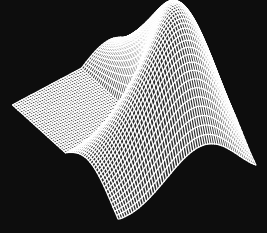
```
>> B(2:4,:)

ans =

    0.7431   0.6948   0.456    0.9597   0.5472   0.1966   0.7572   0.5688   0.2630   0.5383
    0.3922   0.3171   0.6463   0.3404   0.1386   0.2511   0.7537   0.4694   0.6541   0.9961
    0.6555   0.9502   0.7094   0.5853   0.1493   0.6160   0.3804   0.0119   0.6892   0.0782
```



Matrizes e Vetores – Determinante

→ det (B)

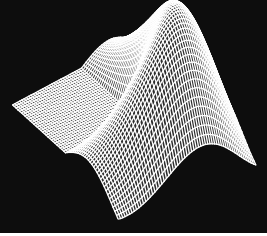
```
>> det(B)

ans =

    0.0081
```



Matrizes e Vetores – Inversa

→ inv (B)

```
>> inv(B)

ans =

  -17.5686  -22.1791   39.7960   -0.7247  -27.8529   23.4407   -1.9684   14.4951   -2.2404    0.3120
    1.4354    1.2051   -2.2684    0.3217    0.7476   -1.9230    0.1281   -0.2613    0.5317   -0.3175
   14.9218   19.2208  -33.2936    1.2043   24.0248  -19.8941    1.7906  -12.4162    0.7152   -0.4059
   18.2597   24.6938  -42.6279    1.5098   29.6867  -24.1443    2.1766  -16.7602    1.8466   -0.0505
    0.6875   -0.0954   -0.4748   -0.8260    0.4301    0.0705   -0.1887    0.5820    0.0257   -0.0219
  -13.1722  -16.9325   28.4983   -0.1690  -20.2140   16.9968   -0.9622   10.7352   -1.2805    0.7610
   -8.4901  -10.3920   19.1248   -0.5786  -13.0649   10.1955   -1.5218    7.6340   -0.8516    0.4706
  -11.4216  -13.4255   24.2549   -1.5379  -16.9185   14.7944   -0.7385    9.6482   -0.5253   -0.4857
   -0.2780   -0.9368    0.6739   -0.1862    0.1148    1.0544   -0.3348    0.0495    0.6673   -0.3444
    5.7528    6.5262  -11.2355    0.3279    7.8149   -7.1317    0.8168   -4.9833    0.3908    0.1690
```

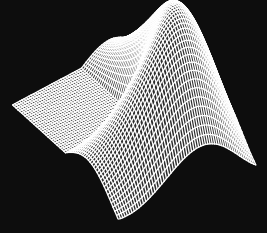


Matrizes e Vetores – Autovalores

→ eig (A)

```
>> A=[2 3 5; 1 7 5; -2 5 -1]

A =

     2     3     5
     1     7     5
    -2     5    -1
```

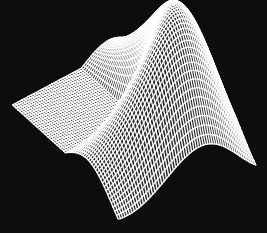
```
>> eig(A)

ans =

   -1.0000
   -0.4244
    9.4244
```



Matrizes e Vetores – Autovetores

→ [P,D]=eig (A)

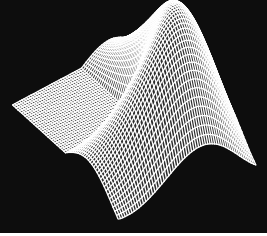
```
[P,D]=eig(A)

P =

    0.7321    0.7998    0.5186
    0.2929    0.2575    0.8055
   -0.6150   -0.5423    0.2868


D =

   -1.0000         0         0
         0   -0.4244         0
         0         0    9.4244
```



Matrizes e Vetores – Eq. Caract.

→ poly(A)

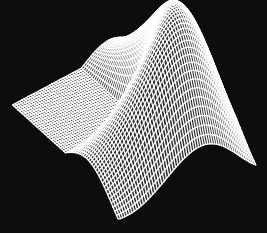
```
>> poly(A)

ans =

    1.0000   -8.0000  -13.0000   -4.0000
```



Matrizes e Vetores – NORMA

→ norm(v)

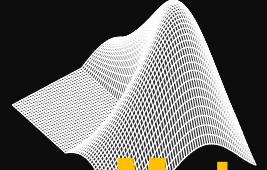
```
>> v=[2  3  5]

v =

     2     3     5

>> norm(v)

ans =

    6.1644
```



Matrizes e Vetores – NORMA

→ norm(v)

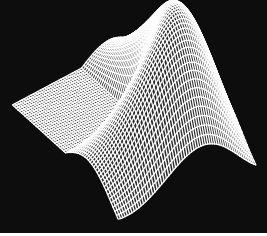
```
>> v=[2  3  5]

v =

     2     3     5

>> norm(v)

ans =

    6.1644
```



Matrizes e Vetores – Produto interno

→ dot(u,v)

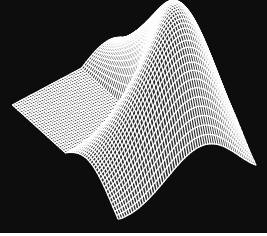
```
>> u=[2 3 6]; v=[2 6 7];
>> dot(u,v)

ans =

    64
```



Matrizes e Vetores – Produto vetorial

→ cross(u,v)

```
>> cross(u,v)

ans =

   -15    -2
6
```



Matrizes e Vetores – média e desv. padrão

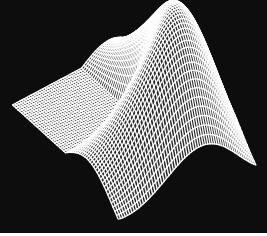
→ mean(u)

Valor médio dos termos de u

→ std(u)

Desvio padrão dos termos de u

```
>> u=[2 3 6];
>> mean(u)

ans =

    3.6667

>> std(u)

ans =

    2.0817
```



Matrizes e Vetores – soma e mediana

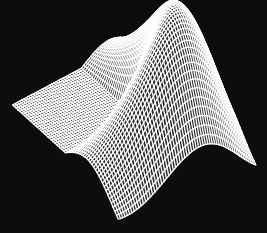
→ median(v)

Mediana dos termos de v

→ sum(v)

Soma dos termos de v

```
v =
     3    5    7    1    9    2    3    24    -2    6    -3     19

>> median(v)
ans =
     4

>> sum(v)
ans =

    74
```



Matrizes e Vetores - extremos

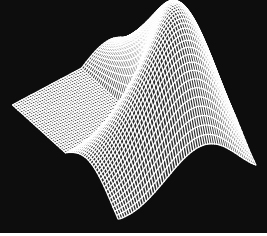
→ max(v)

Maior valor de v

→ min(v)

Menor valor de v

```
v =
     3    5    7    1    9    2    3    24    -2    6    -3   19

>> max(v)
ans =
     24

>> min(v)
ans =

    -3
```

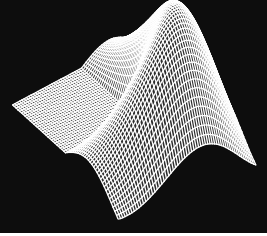


Matrizes e Vetores - ordenar

→ sort(v)

Ordena em ordem crescente

```
v =
     3     5     7     1     9     2     3    24    -2     6    -3    19

>> sort(v)

ans =

    -3    -2     1     2     3     3     5     6     7     9    19    24
```



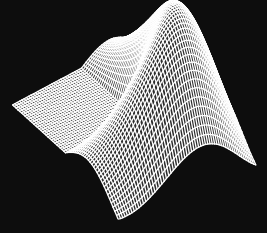
Matrizes e Vetores - Dimensões

→ length(v) e size(B)

Dão dimensões dos vetores / matrizes

```
>> B = [1 2 3;6 2 1];
>> size(B)
ans =
     2     3

>> size(B,1)
ans =
     2
```

```
>> v = linspace(1,12,12);

>> length(v)
ans =
    12
```



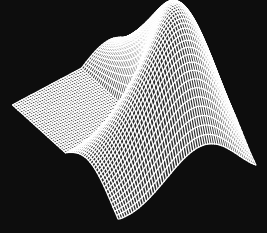
Polinômios

Um polinômio é representado por um vetor linha contendo os coeficientes do polinômio em ordem decrescente

Exemplo:

Declaração do polinômio $-x^5 - 5x^4 + 8x^2 + 30$

```
p = [-1 -5 0 8 0 30].
```



Polinômios - Raízes

→ roots()

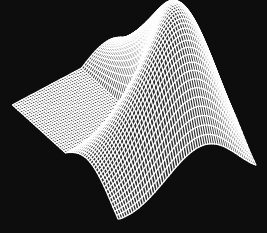
Calcula a raiz do polinômio.

```
>> r = roots(p)

r =

  -4.5416 + 0.0000i
  -2.2503 + 0.0000i
   1.6741 + 0.0000i
   0.0589 + 1.3229i
   0.0589 - 1.3229i
```

→ poly()

Encontra o polinômio correspondente a uma determinada raiz.

```
>> poly(r)

ans =

    1.0000    5.0000    0.0000   -8.0000    0.0000  -30.0000
```

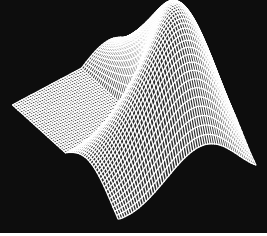


Polinômios - Produto

→ conv()

Calcula o produto entre dois polinômios

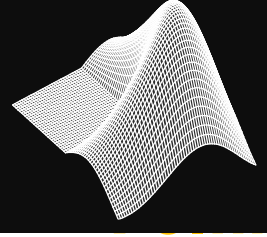
```
>> p1 = [1 2 -3]

p1 =

     1     2    -3

>> p2 = [-1 5]

p2 =

    -1     5

>> conv(p1,p2)

ans =

    -1     3    13   -15
```



Polinômios - Divisão

→ deconv()
Realiza a divisão entre dois polinômios

```
>> [q, r] = deconv(p1,p2)

q =

    -1    -7

r =

     0     0    32
```

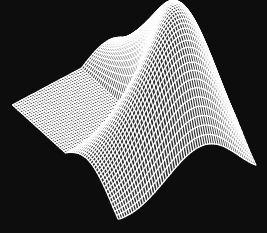


Polinômios podem ser avaliados de duas formas distintas

1ª Forma:

Se x for um escalar

```
>> x = 2;

>> f = 2*x^4 - 5*x^3 + 8*x^2 - 10*x + 40

f =

44
```

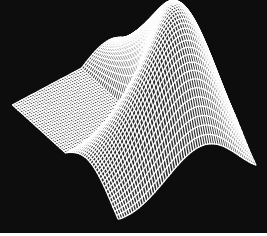


Polinômios - Avaliação de polinômios

1ª Forma:

Se x for um vetor contendo um intervalo de valores, então será necessário utilizar o operador ponto-escalar

```
>> x = 0:0.5:2;

>> f = 2*x.^4 - 5*x.^3 + 8*x.^2 - 10*x + 40

f =

40.0000 36.5000 35.0000 36.2500 44.0000
```



Polinômios - Avaliação de polinômios

2ª Forma:

→ polyval()

Avalia numericamente o polinômio para um dado valor ou conjunto de valores de x

```
>> x = 0:0.5:2;

>> p = [2 -5 8 -10 40];

>> y = polyval(p,x)

y =

40.0000 36.5000 35.0000 36.2500 44.0000
```