Матрицы

1 Действия с матрицами

```
--> a: matrix(
      [2,-1,0],
      [3,4,-2],
      [-3,1,5]
    );

--> b: matrix(
      [3,1,2],
      [-2,1,3],
      [0,2,-4]
    );

--> 4*a-5*b;

--> A: matrix(
      [7,-2,3,-4],
      [0,2,1,-1],
      [-5,3,2,0]
    );

--> B: matrix(
      [2,-1,-3,1],
      [7,-1,0,4],
      [8,-2,1,5]
    );

--> 3*A+4*B;

--> A: matrix(
      [3,-2],
      [5,-4]
    );
```

```
-->      B: matrix(
          [3,4],
          [2,5]
         );

-->      A+B;

-->      A: matrix(
          [1,2],
          [3,6]
         );

-->      B: matrix(
          [2,6],
          [-1,-3]
         );

-->      A+B;

-->      A: matrix(
          [2,1],
          [5,3]
         );

-->      B: matrix(
          [3,-1],
          [-5,2]
         );

-->      A+B;

-->      A: matrix(
          [3,-2],
          [5,-4]
         );

-->      B: matrix(
          [3,4],
          [2,5]
         );
```

```
-->     A.B;

-->     A: matrix(
          [1,2],
          [3,6]
        );

-->     B: matrix(
          [2,6],
          [-1,-3]
        );

-->     A.B;

-->     A: matrix(
          [2,1],
          [5,3]
        );

-->     B: matrix(
          [3,-1],
          [-5,2]
        );

-->     A.B;

-->     A: matrix(
          [3,-2],
          [5,-4]
        );

-->     B: matrix(
          [3,4],
          [2,5]
        );

-->     A.B;

-->     B.A;
```

```
-->      A: matrix(
          [4,0,-2,3,1]
         );

-->      B: matrix(
          [3],
          [1],
          [-1],
          [5],
          [2]
         );

-->      A.B;

-->      B.A;

-->      A: matrix(
          [1,2],
          [3,6]
         );

-->      B: matrix(
          [2,6],
          [-1,-3]
         );

-->      A.B;

-->      B.A;

-->      A: matrix(
          [2,1],
          [5,3]
         );

-->      B: matrix(
          [3,-1],
          [-5,2]
         );
```

```
(-->  A.B;

(-->  B.A;

(-->  f(x):=3*x^3+x^2+2;

(-->  A: matrix(
       [1,5],
       [0,-3]
      );

(-->  f(a);

(-->  f(x):=x^3-6*x^2+9*x+4;

(-->  A: matrix(
       [1,0,0],
       [0,2,-1],
       [0,1,4]
      );

(-->  f(A);
```

2 Транспонирование матриц

```
(-->  A: matrix(
       [3,0],
       [2,-5]
      );

(-->  transpose(A);

(-->  A: matrix(
       [1,0],
       [-3,2],
       [5,-1]
      );

(-->  transpose(A);
```

3 Приведение матриц ступенчатому виду

```
(%i1) A: matrix(
       [2,3,-2],
       [3,1,1],
       [1,5,-5]
      );
(%o1)                  matrix([2, 3, -2], [3, 1, 1], [1, 5, -5])
(%i2) echelon(A);
(%o2)                  matrix([1, 5, -5], [0, 1, -1], [0, 0, 0])
(%i3) triangularize(A);
(%o3)                  matrix([1, 5, -5], [0, -14, 13], [0, 0, 0])
(%i4) A: matrix(
       [2,3,-2,3],
       [3,1,1,2],
       [1,5,-5,4]
      );
(%o4)                  matrix([2, 3, -2, 3], [3, 1, 1, 2], [1, 5, -5, 4])
(%i5) echelon(A);
(%o5)                  matrix([1, 5, -5, 4], [0, 1, -1, 1], [0, 0, 0, 0])
(%i6) triangularize(A);
(%o6)                  matrix([1, 5, -5, 4], [0, -14, 13, -10], [0, 0, 0, 0])
(%i7) A: matrix(
       [1,-3,1,13],
       [3,1,-7,9],
       [-1,2,0,-10],
       [2,1,-5,5]
      );
(%o7)                  matrix([1, -3, 1, 13], [3, 1, -7, 9], [-1, 2, 0, -10], [2, 1, -5, 5])
(%i8) echelon(A);
(%o8)                  matrix([1, -3, 1, 13], [0, 1, -2, 5], [0, 0, 0, 0], [0, 0, 0, 0])
(%i9) triangularize(A);
(%o9)                  matrix([1, -3, 1, 13], [0, 10, -10, -30], [0, 0, 0, 0], [0, 0, 0, 0])
(%i10) A: matrix(
       [1,-2,1,11],
       [3,-1,2,5],
       [2,1,-3,-18],
       [5,0,-1,-13]
      );
(%o10)                 matrix([1, -2, 1, 11], [3, -1, 2, 5], [2, 1, -3, -18], [5, 0, -1, -13])
```

```
--> echelon(A);

--> triangularize(A);
```

4 Удаление элементов из матрицы

```
--> A: matrix(
     [1,-3,1,13],
     [3,1,-7,9],
     [-1,2,0,-10],
     [2,1,-5,5]
    );

--> submatrix(1,A);

--> submatrix(1,A,2);

--> submatrix(1,4,A,2,3);
```