

MATH 333

Matrices and Vectors April 9, 2008

Entering Matrices and Vectors in Matlab

A row vector is entered as

```
>>v = [7 3 9]
```

```
v =
```

```
7 3 9
```

Elements in a row are separated by spaces or commas.

Semicolons separate rows. An example of a column vector is

```
>>w = [2; 6; 1]
```

```
w =
```

```
2
```

```
6
```

```
1
```

An example of a 3 x 3 matrix is

```
>>A = [1 2 3; 5 7 11; 13 17 19]
```

```
A =
```

```
1 2 3
```

```
5 7 11
```

```
13 17 19
```

Elements of a matrix can be referred to with subscript notation. For example,

```
>>A = [1 2 3; 5 7 11; 13 17 19]
```

```
>>A(3,2)
```

```
ans =
```

```
17
```

A colon can be used as a wild card to refer to an entire row or column:

```
>>A(:,1)
```

```
ans =
```

```
1
```

```
5
```

```
13
```

Matrix Operations

Addition and *Multiplication* operators for matrices are + and *, if the dimensions are correct. To see the dimension, type

```
>>size(A)
```

```
ans =
```

```
3 3
```

The *transpose* operator is a single quote appended to a matrix or vector, so if
>>v = [7 3 9]
v =

7 3 9
then
>>v'
ans =
7
3
9

A matrix transpose uses the same notation.

The *inverse* can be found by
>>inv(A)

Exercises

1. Let

$$\mathbf{A} = \begin{bmatrix} 1 & -2 & 0 \\ 3 & 2 & -1 \\ -2 & 1 & 3 \end{bmatrix} \quad \text{and} \quad \mathbf{B} = \begin{bmatrix} 4 & -2 & 3 \\ -1 & 5 & 0 \\ 6 & 1 & 2 \end{bmatrix}$$

- (a) Calculate $\mathbf{A}^T + \mathbf{B}^T$.
- (b) Calculate $(\mathbf{A} + \mathbf{B})^T$.
- (c) Are (a) and (b) the same? If not, how do they differ?

2. Let

$$\mathbf{x} = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} \quad \text{and} \quad \mathbf{y} = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}$$

- (a) Calculate $\mathbf{x}^T \mathbf{y}$.
- (b) Calculate $\mathbf{y}^T \mathbf{x}$.
- (c) Are (a) and (b) the same? If not, how do they differ?

3. Let

$$\mathbf{A} = \begin{bmatrix} 1 & -2 & 1 \\ 0 & 2 & -1 \\ 2 & 1 & 1 \end{bmatrix} \quad \text{and} \quad \mathbf{B} = \begin{bmatrix} 2 & 1 & -1 \\ 1 & -1 & 0 \\ 2 & -1 & 1 \end{bmatrix}$$

- (a) Calculate \mathbf{AB} .
- (b) Calculate \mathbf{BA} .
- (c) Are (a) and (b) the same? If not, how do they differ?

4. Let

$$\mathbf{A} = \begin{bmatrix} 3 & -1 \\ 6 & 2 \end{bmatrix}$$

- (a) Calculate $|\mathbf{A}|$.
- (b) Calculate \mathbf{A}^{-1} .
- (c) Calculate \mathbf{AA}^{-1} .
- (d) Calculate $\mathbf{A}^{-1}\mathbf{A}$.
- (e) Are (c) and (d) the same? If not, how do they differ?