

```
% GNU Octave is a (programmable) calculator and is very good at performing
% matrix operations. The basic syntax is the same as MATLAB's. At Octave's
% command prompt, a command can be entered. If you end a line with a semicolon,
% the output is suppressed. If the output is longer than one screen, you might
% have to press 'q' to get back to the prompt. Everything you enter at the
% prompt can as well be written into a script file with extension .m (like this
% one). Scripts can be executed by calling its name. Comments are done with the
% '%' sign.
```

```
%%%%%%%% GETTING HELP
```

```
% The command 'help <command>' displays the help text for the desired
% command.
```

```
help rand
```

```
% Search for the given string in the help text of all functions.
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```
lookfor eigenvalues
```

```
% List all currently defined variables
```

```
who
```

```
% Delete all variables defined until now
```

```
clear
```

```
%%%%%%%% DATA ENTRY
```

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% Vectors and matrices are entered using square brackets [ ].
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```
% Elements are separated by a space or a comma, a new row is
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```
% started with a semicolon:
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```
% A 1x4 row vector
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```
a = [ 1, 2, 3, 4 ]
```

```
a2 = [ 1 2 3 4 ]
```

```
% A 2x2 matrix
```

```
A = [ 1, 2; 3, 4 ]
```

```
A2 = [ 1 2; 3 4 ]
```

```
%%%%%%%% DATA GENERATION
```

```
% Generate a row vector with elements 1, ..., 10
```

```
b = [1:10]
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```
% Generate a row vector with elements 1, 1.1, 1.2, ..., 10
```

```
c = [1:0.1:10]
```

```
% Create a 2x3 matrix filled with zeros or ones respectively
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```
C = zeros(2,3)
```

```

D = ones(2,3)

% Create a 2x2 identity matrix
E = eye(2)

% Create a column vector of 10 uniformly distributed random numbers
% between 5 and 15.
u = unifrnd(5, 15, 10, 1)
% Create a 5x5 matrix with normally distributed random variables with a
% mean of 2.5 and a sigma of 5.0.
N = normrnd(2.5, 5.0, 5, 5)

%%%%%%%% DATA ACCESS

% All indices in Octave start with 1, as opposed to 0 as usual in other
% programming languages.

% Retrieve the element in row 1 and column 2
A(1,2)

% Retrieve all elements of row 1 in the matrix
A(1,:)

% Retrieve all elements of column 2 in the matrix
A(:,2)

%%%%%%%% MATRIX OPERATIONS

% Transpose
A'

% Matrix addition, subtraction, multiplication and inversion
F = A + E + C * D'
G = F * inv(F)

% Element-wise operations
H = A * 2 + A .* E + A .^ 2

%%%%%%%% OTHER FUNCTIONS
% Can be used on scalars as well as matrices. When applied to matrices the
% operations are performed elementwise.
a = 2
b = 3
v = [2 4 6]
w = [3 5 7]
sin(a)
sin(v)

```

```

cos(a)
cos(v)
atan2(a, b)
atan2(v, w)
sqrt(a)
sqrt(v)

```

%%%%%%%% PROGRAMMING CONSTRUCTS

```

% Functions
% Functions have the following layout:
% function [retval1, retval2, ...] <function_name>(arg1, arg2, ...)
%     <function body>
% end
% Returning values is performed by assigning values to the return values
% defined in the header of the function.
function y = add_two_numbers(a, b)
    y = a + b;
end

```

```

% For loops
for i=[1:10]
    if mod(i,2) == 0
        disp(['even: ', num2str(i)])
    else
        disp(['odd: ', num2str(i)])
    end
end
end

```

%%%%%%%% BASIC PLOTTING

```

% Create a vector of values in the range [1, 10] with an increment of 0.1
% and suppress the output (semicolon at the end).
x = 1:0.1:10;
% Compute sin() for all elements of the vector
y = sin(x);

% Close all existing plot windows
close all
% Plot the the values of x against those in y
plot(x, y)
% Draw following plots into the same figure. If this is not set subsequent
% plots erase the previously generated plots.
hold on
% Plot the cosine of the data points in green (g) with markers (+)
% instead of lines.
plot(x, cos(x), '+g');

```

```
% Plot a blue point
plot(2, 0.5, 'ob');

% Save the complete plot to a file.
print('/tmp/plot.png', '-dpng')
```