

MATHLAB

MATHLAB is a proprietary multi-paradigm programming language and numeric computing environment developed by mathworks. MATHLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms creation of user interfaces and interfacing with programs written in other language.

SYNTAX

The MATHLAB application is built around the MATHLAB programming language. Common usage of the matlab application involves using the "Command window" as an ~~interactive~~ mathematical shell or executing txt files containing MATHLAB code.

Variables

Variables are ~~defined~~ using the assignment operator. MATHLAB is a weakly typed programming language because types are implicitly converted.

Arithmetic Operation

Operator	Meaning
+	Addition
-	Subtraction
*	Multiplication
\	Left division
/	Right division
n	Power

The difference between left division ($\backslash$) and right division ($/$) is as :

$$8/4 = 2$$

It means $8/4 = 2$

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$$8 \backslash 4 = 0.5000$$

It means $4/8 = 0.5000$

Trigonometric function

Command	Function
$\sin()$	Sine
$\cos()$	Cosine
$\tan()$	tangent
$\cot()$	cotangent
$\sec()$	secant
$\csc()$	Cosecant

Derivatives in MATLAB

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Lets take some examples and learn some Syntax

$y = x^6$ Ans = $6x^5$	MATLAB WINDOW >> Syms Space X - Enter >> $y = x^6$; - Enter >> diff(y) - Enter
$y = 2x^5$ Ans = $10x^4$	>> Syms Space X - Enter >> $y = 2 * x^5$; - Enter >> diff(y) - Enter
$y = (x+2) * (x^2+3)$	>> Syms Space X - Enter >> $y = (x+2) * (x^2+3)$; Enter >> diff(y) - Enter
$y = 7x^{10} + 5x^3$ Ans = $70x^9 + 15x^2$	>> Syms Space X - Enter >> $y = 70 * x^9 + 15 * x^2$; - Enter >> diff(y) - Enter
$y = \sin x$	>> Syms Space X - Enter >> $y = \sin x$ - Enter >> diff(y) - Enter

$$y = \cos x$$

$$\text{Ans} = -\sin x$$

>> Syms space x - Enter

>> y = cos x - Enter

>> diff(y) - Enter

$$y = e^x$$

$$\text{Ans} = e^x$$

>> Syms space x - Enter

>> y = e^x - Enter

>> diff(y) - Enter

$$y = \log x$$

$$\text{Ans} = 1/x$$

>> Syms space x - Enter

>> y = log x - Enter

>> diff(y) - Enter

$$y = \int (n+1) dn$$

$$\text{Ans} = n + \frac{n^2}{2}$$

>> Syms space n - enter

>> y = (n+1) dn

>> int(y) - enter

$$y = \sqrt{1 + \cos(n)}, n]$$

$$\text{Ans} = 2\sqrt{1 + \cos(n)} \tan\left[\frac{n}{2}\right]$$

>> Syms space n - enter

>> y = (1 + cos(n)) ¹/₂ ;

>> int(y) - enter

$$\lim_{n \rightarrow 0} \frac{\sin 3n}{n}$$

>> Syms space n -> Enter
 >> Limit (sin (3*n) space /
 space n, space n, 0) -> Enter

$$\lim_{n \rightarrow 1} \frac{n^2 + 4n + 5}{n}$$

>> Syms space n -> Enter
 >> Limit (n^2 + 4*n + 5) / n
 -> Enter

$$\lim_{n \rightarrow 1} \frac{3n+5}{2n-1}$$

>> Syms space n -> Enter
 >> Limit (3*n + 5) / (2*n - 1)
 -> Enter

$$\lim_{n \rightarrow 1} \frac{n^2 - 5n + 4}{n^2 + 6n - 7} = 1$$

$$\text{Ans} = 1$$

>> Limit (n^2 - 5*n + 4) /
 (n^2 + 6*n - 7)
 space n, 1 -> Enter

$$\lim_{n \rightarrow 1} \frac{(n^2 + 3n + 2)}{(n^2 + 4n + 3)} = 1$$

$$\text{Ans} = 1$$

>> Syms space n -> Enter
 >> Limit (n^2 + 3*n + 2) /
 (n^2 + 4*n + 3),
 space n, 1 -> Enter

$$\lim_{n \rightarrow 0} (3n^3 - 15n^2 - 12n - 17)$$

$$\text{Ans} = -17$$

>> Syms space n -> Enter
 >> Limit (3*n^3 - 15*n^2 -
 12*n - 17, space n, 0)
 -> Enter

$$\lim_{n \rightarrow y} \frac{\cos n + \cos y}{n - y}$$

$$\text{Ans} = -\sin y$$

>> Syms n y -> Enter
 >> f = (cos(n) + cos(y)) /
 (n - y); -> Enter
 >> Limit (f, n, y) -> Enter

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MATLAB CODE For Newton-Raphson method

function [n, N] = newton method (a, tol)

N = 0;

n = a;

[f, dfdn] = equation(n);

while abs(f) > Tol

n = n - f / dfdn;

[f, dfdn] = equation(n);

N = N + 1;

end

End

Tribhuvan University

Final Practical Exam 2021

BCA 2nd Semester

Mathematics II (CAMT154)

FM: 10

By Using MATLAB/ Mathematica /Python

1. Evaluate: $\lim_{x \rightarrow y} \frac{\cos x - \cos y}{x - y}$
2. Find the derivative of $y = (x^2 \tan x)$.
3. Evaluate the integral: $\int (5 - 6x) dx$.
4. Using simplex method, Find the optimal solution of the following linear programming problem.

Max $Z = 7x + 5y$ subject to constraints, $x + 2y \leq 6$, $4x + 3y \leq 6$, $x, y \geq 0$.
5. Using Newton -Raphson method, find a root of $2x^2 - 3x - 1 = 0$. taking $x_0 = 1$ with error less than 10^{-4} .