CE305 Numerical Methods for Civil Engineers **2012-2013 Fall**

Handout on Calculator (Casio fx-991ES)

The calculator which will be used in exams is CASIO fx-991ES Plus. This handout is prepared for you to exercise with calculator. You should also see the "User's Guide" of the calculator which is available at the web site of course.

Resetting the Calculator

1. Press [SHIFT] [9] → CLR
2. Press [3] → All
3. Press [=] → Yes
4. Press [AC] → Reset All

Fraction Calculations

2 [a b/c] 3 [+] 1 [a b/c] 2 [=] 7⌟6

Press [S⇔D] to obtain 1.166666667 from 7/6.

Display Format

In fraction format

Press [SHIFT] [MODE] → Setup

Press [1] → MthIO

Press [1] → MathO → Fraction Format

In linear format (displays in a single line)

Press [SHIFT] [MODE] → Setup

Press [2] → LineIO

Arithmetic Operations

$4\cdot\sin 30\cdot(10+4\cdot 3)^3\cdot\sqrt[3]{8}=42592$

- Input of the closing parenthesis is required for sin, sinh and other functions that include parentheses. *(Sin is in degrees in this example.)*

Changing Degree to Radian

In terms of degrees:

$\sin(30)=0.5$

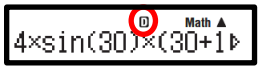
In terms of radians:

$\sin(30)=-0.9880$

Press [SHIFT] [MODE] → Setup

and then choose "Degree", "Radian or "Grad" by pressing [3] Deg [4] Rad [5] Gra .

You can check the current setting from the screen.



Matrix Operations

Assigning elements of matrices:

1. Press [MODE] [6] → Matrix Mode.
2. Press [1] → MatA

   Press [5] → 2x2 matrix
3. Input the elements of MatA: $A=\begin{bmatrix}2 & 1\\ 1 & 1\end{bmatrix}$
4. To input another matrix you should not perform steps 1 and 2! You should:

   Press [SHIFT] [4] → Matrix

   Press [2] → Data (to add or edit matrices)

   Press [2] → MatB

   Press [5] → 2x2 matrix

5. Input elements of MatB: $B=\begin{bmatrix}2 & -1\\ -1 & 2\end{bmatrix}$

Matrix addition

$$A+B=\begin{bmatrix}4 & 0\\ 0 & 3\end{bmatrix}$$

Press SHIFT 4 → Matrix

Press 3 → MatA

Press + → Addition

Press SHIFT 4 → Matrix

Press 4 → MatB

Press = → See the result

Matrix Multiplication:

$$A\cdot B=\begin{bmatrix}3 & 0\\ 1 & 1\end{bmatrix}$$

Press SHIFT 4 → Matrix

Press 3 → MatA

Press × → Multiplication

Press SHIFT 4 → Matrix

Press 4 → MatB

Press = → See the result

Assigning result of a matrix operation to another matrix, namely MatC:

1. Displaying the resultant matrix.

Press SHIFT 4 → Matrix

Press 6 → MatAns

Press = → See the result

2. To store the resultant matrix:

Press SHIFT RCL → STO

Press one of the following keys to specify the new destination of MatAns.

(−) → MatA , → MatB hyp → MatC

Inverse of a matrix:

$$A^{-1}=\begin{bmatrix}1 & -1\\ -1 & 2\end{bmatrix}$$

You cannot use $x^{\blacksquare}$ for this input.

Use the x^{-1} key to input "$^{-1}$".

Press SHIFT 4 → Matrix

Press 3 → MatA

Press x^{-1} → A^{-1}

Solution of Equations

$$x^3+3x^2+3x+1=0$$

1. Press MODE 5 → EQN

to open equation mode.

2. Press 4 to choose the type of equation.

3. Input the coefficients and press =.