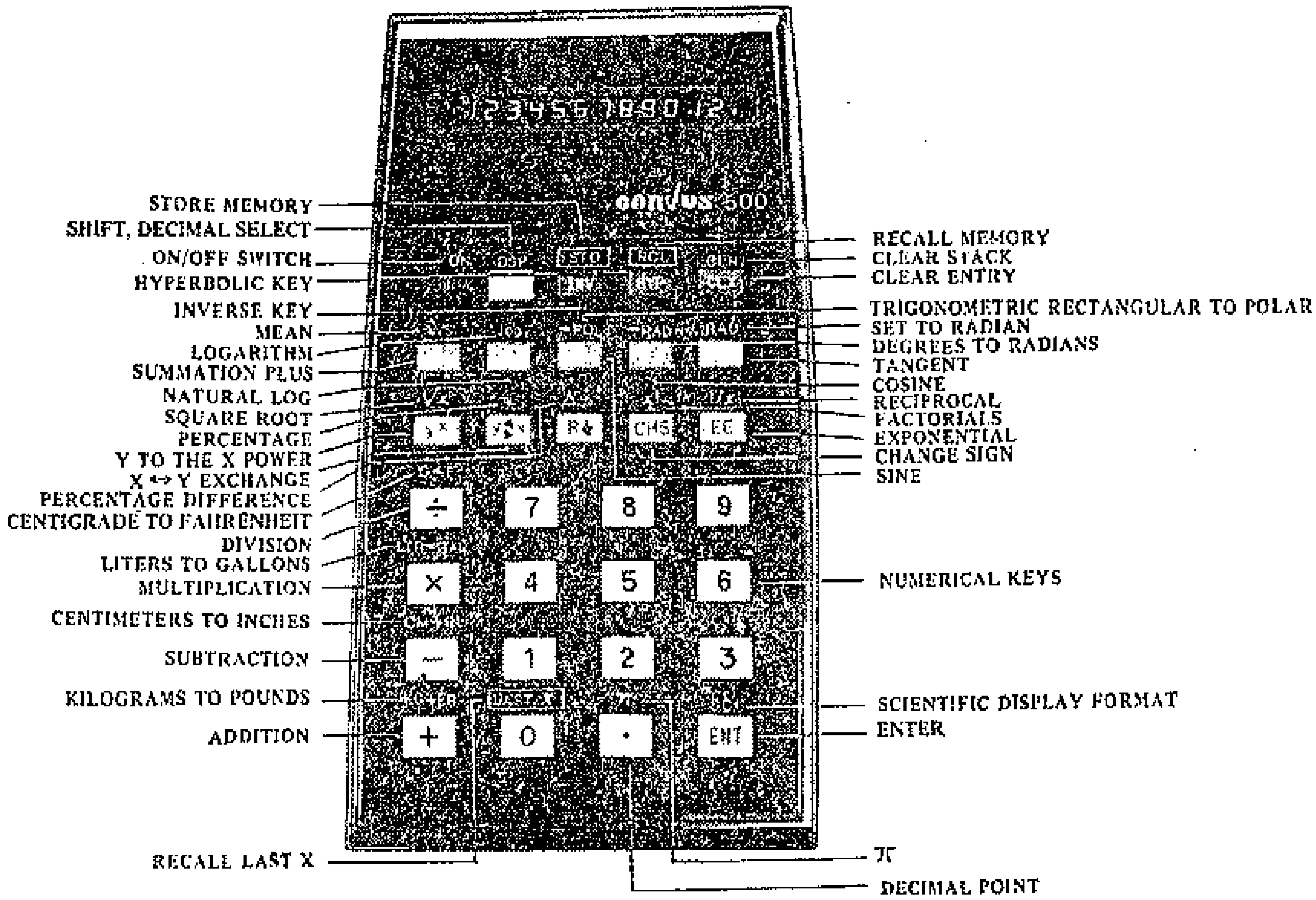
OWNER'S MANUAL

CORVUS 500

KEYBOARD DESCRIPTION



Functions Available on Corvus Model 500

Clear register
Clear display

Scientific display format; 10-digit mantissa, 2-digit exponent, floating decimal
Mode set to radians
Fix decimal point (0–9) in display
Sine
Cosine
Tangent
Hyperbolic sine
Hyperbolic cosine
Hyperbolic tangent

Memory store, 9 registers
Memory recall, 9 registers
Memory exchange, 9 registers
X↔Y exchange

Common log
Natural log

4-stack register
Rotate stack
Recall last X

Y to the X power
Reciprocal for all values, exponent range from + 199 through – 200
Pi
Change sign
Square root
Factorials

Summation plus (Adds X and Y to memory for vector addition; recalls sum of X and sum of Y)
Percentage
Percentage Difference (Δ%)

Mean
Standard deviation

Centigrade to Fahrenheit
Liters to Gallons
Centimeters to Inches
Kilograms to Pounds
Degrees to Radians
Set radian mode for trigonometric functions
Trigonometric rectangular to polar
Hyperbolic rectangular to polar

These functions are obtainable through the INVERSE calculation sequence:

Business display format, 12-digits, floating decimal point
Arc sine
Arc cosine
Anti-log, natural (e^x), for all values from +230 through – 230
Anti log, common (10^x), for all values from + 99.9 through – 99.9
Arc tangent
Arc hyperbolic sine
Arc hyperbolic cosine
Arc hyperbolic tangent
Xth root of Y
Gross profit margin percentage
Summation minus for vector subtraction
Trigonometric polar to rectangular
Hyperbolic polar to rectangular
Set degree mode for Trigonometric functions
X^2
Fahrenheit to Centigrade
Gallons to Liters
Inches to Centimeters
Pounds to Kilograms

Introduction

Corvus 500, "The Secientists/Engineers' Problem Solver", is a scientific calculator which can handle the most advanced types of scientific, engineering, mathematical or statistical problems. It makes calculating faster and less arduous, because the powerful four registers stack with nine memory registers, plus the Reverse Polish Notation, provide the most efficient way known to computer science for evaluating mathematical expressions. The Corvus 500 has far greater computing power than any of the pocket size calculators available, with transcendental functions, such as logarithms, sines and tangents; polar/rectangular coordinate conversions for handling complex arithmetic, vector; multiple storage registers, selecting operating mode and also constants for π and e are provided – as well as four metric/U.S. unit constants for conversions between Cm/In. Kg/lb, Ltr/Gal, C°/F°. Moreover, statistical capabilities for calculating the mean and standard deviation are provided.

This Instruction Manual has been designed to help you to get the most out of your Corvus 500, and in it's pages you will find a reference guide to every basic operation your calculator can perform. You will build up your computational techniques by sitting down with your Corvus 500 and working through this handbook page by page. You will find your Corvus 500 has unique features which make complex problem solving easy.

OPERATING INSTRUCTIONS

Power ON/OFF

Corvus 500 is a rechargeable hand-held calculator. Three rechargeable AA batteries are supplied. Before the calculator is turned ON, make sure the batteries are in correct polarities.

To begin, simply slide the ON/OFF switch to ON. You may start your calculation.

[CLX] Key

Before commencing to work on a problem. Clear the content of the display by pressing the [CLX] Key.

This key has addition functions:-

a) Clearance of the flashing display in case of overflow or *underflow. (Refer to Appendix A)*

b) Clearance of 2 shift flags STO [INV] RCL [HYP]

c) Clearance of display if none of the above.

[CHS] Change Sign Key is used to change the polarity of a number.

For example:

To enter a negative number, key in the number, then depress [CHS], as a result, the number in the display *will change sign.*

Key Sequence	Display
23.4	23.40
[CHS]	−23.40

Second depression of CHS Key will toggle its sign back to positive.

[DSP] The shift key has two basic functions. One is to select fixed decimal point or scientific display notation, while the other function of this key is to change the functional use of keys. Whenever the shift key is depressed, the function of the respective key changes from what is *labeled* on the key top to the function printed just *above the key (i.e. depress* [DSP] [LN], the result will be Log).

OPERATIONS

Most function keys control two functions. One of which is imprinted on the key-top, while the other is on the keyboard plane just above the key.

* To select the function given on the key, merely press down.
* To select the function written just above the key.
  1. Press down [DSP] shift key.
  2. Then press the function key.

Example: to calculate Ln 10

KEY SEQUENCE	DISPLAY
10	10
[LN]	2.30

To calculate Log 10

KEY SEQUENCE	DISPLAY
10	10
[DSP] [LN]	1.00

Since function keys always work either with one or two numbers, for the sake of convenience, those function keys handled by one-number, are called one-number function keys, those keys handled two numbers' calculation, are called Two-number function keys.

Use of One-Number Function

1. Key in the number
2. *Press the desired function key.*

Example 1. Calculate 1/5

KEY SEQUENCE	DISPLAY
5	5
[DSP] [1/X]	0.20

Example 2. Calculate Sin 30

KEY SEQUENCE	DISPLAY
30	30
[SIN]	0.50

Using Display and Rounding Options

The display on Corvus 500 has two display formats, namely, the Business Display Mode and the Scientific Display Mode. Up to fourteen digits can be displayed: mantissa sign; 12 or 10-digit mantissa depends on which mode is selected, exponent sign and 2-digit exponent. Number can be rounded up to any number of decimal places by using the [DSP] key following by the appropriate number to specify the number of decimal places (0–9). When the calculator is turned on, it "defaults" to [DSP] 2; that is, the mode and decimal places setting revert to predesignated once ([DSP] 2) automatically.

A) Business Display Mode.

12-digit Mantissa

[–1. 2 3 4 5 6 7 8 9 0 1 2]

Sign Decimal point

Business display can be selected by depressing [DSP] [INV] [SCI]

Example:

KEY SEQUENCE	DISPLAY
169.48726	169.48726
[DSP] 4	169.4873
[DSP] 6	169.487260

B) Scientific Display Mode.

10-digit mantissa Exponent of 10

[–1. 2 3 4 5 6 7 8 9 0 – 2 3 .]

Sign Decimal point

Exponent of 10 sign

Scientific display is useful when working with either very large or very small numbers, and allows all answers to be displayed with a specific number of digits after the decimal point. When scientific display is required simply depress [DSP] [SCI]

Example:

KEY SEQUENCE	DISPLAY
123.456	123.456
[DSP] [SCI]	1.23456 02
	(1.23456×10^2)
[DSP] 2	1.23 02
[DSP] 6	1.234560 02

Use of Two-Number Functions

[+] [–] [x] and [÷] are examples of two-number function keys. One cannot add, substract, multiply or divide unless there are two numbers present in the memory of the calculator.

Note: Two number function keys work in the same way as one-number function keys, i.e., both numbers must be entered before the function key is depressed.

To perform an operation:

1. Key in the first number
2. Enter it into the stack by depressing [ENT]
3. Key in the second number
4. Depress function key to perform the operation.

Example: To Multiply 5 by 4

KEY SEQUENCE		DISPLAY
5	(The first number)	5
[ENT]	(To separate the first number from the second)	5.00
4	(The second number)	4
[X]	(The function key)	20.00

As one may notice, in the key board of Corvus 500, no [=] key has been found. Instead, there is a [ENT] key. Thank to this key, and also a parenthesis-free logic, named the Reverse Polish Notation, even the most complex mathematical problems can be reduced to a relatively few, easily-handled steps. With RPN the entry sequence is more efficent and easy to understand, and you can use ONE SET OF RULES for all problem sequences, fewer key strokes are required in most chain-calculations involving sum-of-products or product-of-sums. With RPN, plus 9-memory registers, you can work with the most complicated mathematical equations with full confidence of accuracy.

When solving a mathematical problem, the following procedures should be followed:

1. Break down the complex problem into a series of two-number problems, work with two numbers at a time, from left to right, just as if you were solving the problem on paper.
2. Determine whether operation can be performed; if so, proceed.
3. If not, press [ENT] which saves the number for future use.
4. Repeat Step 1, through Step 3 until calculations have been completed.

Example 1 Calculate

$$\frac{(10 \div 2 - 2) + (12 \times 2 + 3) \times (16 \div 4 \times 2)}{24}$$

		KEY SEQUENCE	DISPLAY
Refer to Step 1	10	[ENT]	10.00
Step 2	2	[÷]	5.00
Step 2	2	[−]	3.00
Step 1		12	12
Step 3		[ENT]	12.00
Step 2	2	[X]	24.00
Step 2	3	[+]	27.00
Step 2		[+]	30.00
Step 1		16	16
Step 3		[ENT]	16.00
Step 2	4	[÷]	4.00
Step 2	2	[X]	8.00
Step 2		[X]	240.00
Step 2	24	[÷]	10.00

Let's solve the following problem which converts the indicated air speed to the true mach number.

Example 2.

$$\sqrt{5\left(\left[\left(\left(\left(\frac{400}{661.5}\right)^2(.2)+1\right)^{\frac{1.4}{.4}}-1\right)\frac{29.96}{15}+1\right]^{.286}-1\right)}$$

	KEY SEQUENCE		DISPLAY
	400	[ENT]	400.00
	661.5	[÷]	0.60
[DSP]	[INV]	[√X]	0.37
	.2	[X]	0.07
	1	[+]	1.07
	1.4	[ENT]	1.40
	.4	[÷]	3.50
		[Y^X]	1.28
	1	[−]	0.28
	29.96	[ENT]	29.96
	15	[÷]	2.00
		[X]	0.56
	1	[+]	1.56
	.286	[Y^X]	1.14
	1	[−]	0.14
	5	[X]	0.68
	[DSP]	[√X]	0.82

Exercise:

1. Calculate $\dfrac{\left(\frac{12.6}{7.5}\right)^2 + \left(\frac{32.7}{5.3}\right)^2}{6^2 + 9^3}$ (Ans: 0.05)

2. Calculate $\dfrac{(39)^2}{7} + 68 \times 2^2 + (67 \times 9) + 9^3$

(Ans: 1821.29)

How the Stack Works

The four operational registers and ten memory registers form the Corvus 500 "Memory Stack". It is of advantage for the user to be acquainted with the basic operation of memory stacks. The better one understands the greater the benefit.

The operational stack constitutes four registers; the X,Y, Z,W, and the X register also called the Display Register, since the number displayed also represents the content of the X register.

When power is switched ON, these four registers are cleared to zero.

W	0	
Z	0	
Y	0	
X	0	(Always displayed)

One can also place all 0's in (clear) four registers by means of pressing [DSP] [CLR]

When a number is keyed in, it immediately is written into the display X-register, and the content of the other registers will remain unchanged.

For example, key in 123, the stack register would look like

W	0
Z	0
Y	0
X	123

[R↓] Roll Down Key. One can, however, review the entire stack contents at any time. When this key is depressed, the stack contents shift downward one register.

Example: When you press [R↓]

W	0	Change to →	W	123
Z	0		Z	0
Y	0		Y	0
X	123		X	0

As a result, the content of X-register displayed is 0.

Pressing the [R↓] key, the stack contents are shifted again

W	123		W	0
Z	0	Change to →	Z	123
Y	0		Y	0
X	0		X	0

Depress [R↓] twice again, the original content of the register will be back at starting point.

W	0		W	0
Z	0	Back to the Start again →	Z	0
Y	123		Y	0
X	0		X	123

[X↔Y] Exchange Key. When this key is depressed, the contents of X and Y registers will be exchanged automatically.

Example: When [X↔Y] is depressed.

	W	0		W	0
From	Z	0		Z	0
	Y	123	To →	Y	456
	X	456		Z	123

[ENT] Enter Key is applied in two-number function operation. Press [ENT] to change the contents of the registers.

	From this	Press [ENT] →		
W	0		W	0
Z	0		Z	0
Y	0		Y	123
X	123		X	123

At present, the number in X register is copied into Y, and X register is ready to accept a new number.

		Key in 246.00 →			Press [ENT] →		
W	0		W	0		W	0
Z	0		Z	0		Z	123
Y	123		Y	123		Y	246
X	123		Z	246		X	246

[CLX] Clear X register key. Clears display X register only.

Example: If you key in 246 instead of 357.

		Press [CLX] →			Key in 357 →		
W	0		W	0		W	0
Z	0		Z	0		Z	0
Y	123		Y	123		Y	123
X	123		X	0		X	357

Upon the depression of [CLR], the contents of four operational registers and also the last X register will be cleared, however, it does not affect memory registers 1–9.

To demonstrate how the stack works during an arithematic calculation.

Example: 24 + 37 = ?

		Key In	Press [ENT] →		
Key In 24 →	W	0		W	0
	Z	0		Z	0
	Y	0		Y	24
	X	24		X	24

			Press [+] →		
Key In 37 →	W	0		W	0
	Z	0		Z	0
	Y	24		Y	0
	X	37		X	61

The stack automatically "lifts" every calculated number in the stack when a new number is keyed in and also automatically "drops" when performing a operation.

To Correct Input Errors

[Last X] Key. Last X is a special storage register which automatically stores the last input argument preceding the last function performed, which can be recalled by depressing [RCL] [LAST X]. This is à very useful feature for correcting errors, such as pressing the wrong arithematic operator key or entering the wrong number. For example, if you meant to substract 4 from 16 but multiply instead, you could compensate as follows:

KEY SEQUENCE	DISPLAY
16 [ENT] 4 [X]	64.00
[RCL] [Last X]	4.00
[÷]	16.00
[RCL] [Last X]	4.00
[−]	12.00

If you want to correct a number in a chain calculation [Last X] can save you from starting over. For example, divide 14 by 3 after you have divided by 5 in error.

KEY SEQUENCE	DISPLAY
14 [ENT] 5 [÷]	2.80
[RCL] [Last X]	5.00
[X]	14.00
3 [÷]	4.67

Storing and Recalling Data

In addition to the last X-register and 4 operational registers, there are nine registers available for user storage. Register 1 - 6 are named the general purpose registers used for temporary storage, 7 - 9 are restricted registers which are used when performin $\Sigma+$, $\Sigma-$, $\bar{X}$, S.

[STO] (Store) key and [RCL] (Recall) key are used to store or recall any number into, or from, one of the ten (0 - 9) registers.

Example: Store 12345 into register 5.

KEY SEQUENCE	DISPLAY
12345 [STO] 5	12345.00

If recall the content of register 5

KEY SEQUENCE	DISPLAY
[RCL] 5	12345.00

Statistical Calculation

When Statistical Calculations are performed, the following procedure should be followed:

1. Prior to starting the summation, depress [DSP] [CLR] to clear the previous contents of registers.

2. Key in each value, then depress [Σ+] key. To correct an incorrect value before it is loaded with [Σ+] press [CLX] After the value is summed, correct by *(a) reentering incorrect value, then* (b) pressing [INV] [Σ+], followed by (c) entering correct value, and finally (d) pressing [Σ+]; then continue entering values.
3. After the summation process has been done, press [DSP] [X,S] to obtain the mean (X).
4. Depress [X↔Y] to obtain the standard deviation (S).
5. An additional number can be added on by keying in the required number and pressing [Σ+] key.
6. One may depress [RCL] 7 (Recall register 7) to obtain the number of entries.
7. By pressing [RCL] 8 and [RCL] 9, both the sums of the square of X-register entries and the sum of X-register entries can be obtained.

Example 1. The grades of a student on six examinations were 82, 75, 63, 77, 88, 83. What is the arithematic mean and standard deviation?

KEY SEQUENCE	DISPLAY
[DSP] [CLR]	0.00
82 [Σ+]	82.00
75 [Σ+]	75.00
65 [Σ+]	65.00 (Erroneous entry)
65 [INV] [Σ+]	65.00 (Error recovery Σ –)

63 [Σ+]	63.00
77 [Σ+]	77.00
88 [Σ+]	88.00
83 [Σ+]	83.00
[DSP] [x̄,S]	78.00 (Mean)
[X↔Y]	8.67 (Standard deviation)
[RCL] [Σ+]	468.00 (Sum of X-register entries)
[X↔Y]	0.00 (Sum of Y-register entries)
[RCL] 7	6.00
[RCL] 8	36880.00 (Sum of X^2— register entries)
[RCL] 9	468.00 (Sum of X-register entries)

Example 2. A class of fifteen had the following distribution of test grade: 95 (2 persons), 90 (1 person), 88 (3 persons), 85 (4 persons), 80 (5 persons). What is the class average? What is the standard deviation and variance?

KEY SEQUENCE	DISPLAY
[DSP] [CLR]	0.00
95 [Σ+] [Σ+]	95.00
90 [Σ+]	90.00
88 [Σ+] [Σ+] [Σ+]	88.00
85 [Σ+] [Σ+]	85.00
[Σ+] [Σ+]	85.00
8 [Σ+]	8.00 (Erroneous entry)
[INV] [Σ+]	8.00 (Error recovery Σ−)
80 [Σ+] [Σ+] [Σ+]	80.00
[Σ+] [Σ+]	80.00
[DSP] [x̄, S]	85.60 (Average grade)
[X↔Y]	5.15 (Standard deviation by unbiased method)
[DSP] [INV] [√x]	26.54 (Variance by unbiased method)
[RCL] 7	15.00 (Number of total samples).

Keying in Exponents

One may key in numbers having exponents by pressing [EE] (enter Exponent). For example, key in 20 million (20×10^6)., and multiply it by 50.

KEY SEQUENCE	DISPLAY
20 [EE]	20. 00
6	20. 06
[ENT]	20000000.00
50 [X]	1000000000.00

or you can key in exact power of ten. e.g. key in million (10^6) and divide by 100.

KEY SEQUENCE	DISPLAY
[EE] 6	1.06
[ENT]	1000000.00
100 [÷]	10000.00

The Inverse Calculation

[INV] Inverse function key is to instruct the calculator to compute the inverse function of the applicable function keys

For example: X^2 function can be obtained easily by use of the inverse function key.

To calculate 100^2

KEY SEQUENCE	DISPLAY
100 [ENT]	100.00
[INV] [DSP] [√x]	10000.00

or to calculate Sin^{-1} 0.5 in degree

KEY SEQUENCE	DISPLAY
[DSP] [RAD]	0.00
.5 [INV] [SIN]	30.00

The following table lays out the possible inverse functions which can be obtained by using the [INV] key.

FUNCTION	KEY SEQUENCE
Sin^{-1}	[INV] [SIN]
Cos^{-1}	[INV] [COS]
Tan^{-1}	[INV] [TAN]
$Sinh^{-1}$	[INV] [HYP] [SIN]
$Cosh^{-1}$	[INV] [HYP] [COS]
$Tanh^{-1}$	[INV] [HYP] [TAN]
$\sqrt[x]{Y}$	[INV] [Y^x]
Σ −	[INV] [Σ+]
e^x	[INV] [Ln]
10^x	[INV] [DSP] [Log]
Polar→Rectangular (trig)	[INV] [DSP] [→POL]
Polar→Rectangular (HYP)	[INV] [HYP] [DSP] [→POL]

Radians→Degrees	[INV] [RAD]
Degree/Angle selector	[INV] [RAD]
F°→C°	[INV] [DSP] [C↔F]
LTR→GAL	[INV] [DSP] [GAL↔LTR]
IN→CM	[INV] [DSP] [CM↔IN]
LB→KG	[INV] [DSP] [LB↔KG]
X^2	[INV] [DSP] [√x]
GPM %	[INV] [DSP] [%]
Business Display format	[INV] [DSP] [SCI]

Trigonometric Function

The following trigonometric functions are provided:

KEY SEQUENCE	FUNCTION
[SIN]	Sine
[INV] [SIN]	Arc Sine
[COS]	Cosine
[INV] [COS]	Arc Cosine
[TAN]	Tangent
[INV] [TAN]	Arc Tangent

To use the [SIN], [COS] and [TAN] functions, key in the number and depress the appropriate function key.

Example 1. Calculate Sin 30° (degree).

KEY SEQUENCE	DISPLAY
30 [SIN]	0.50

Example 2. Calculate Tan (π/18) (radian).

KEY SEQUENCE	DISPLAY
[DSP] [RAD]	0.00 .
[DSP] π	3.14 .
18 [÷]	0.17 .
[TAN]	0.18 .

Example 3. Find the Sine of the angle that is opposite the long side of a right triangle that has a 2 inch hypotenuse and a short side that is 1 inch long. (Ref to Fig. 1)

KEY SEQUENCE	DISPLAY
1 [ENT]	1.00
2 [÷]	0.50 (Cosine of unknown angle)
[INV] [COS]	60.00 (Angle)
[SIN]	0.87 (Sine of angle)
[DSP] [SCI]	8.660254037–01 (Floating Scientific)
[DSP] 4	8.6603– 01 (Fixed four decimal places)
[INV] [DSP] [SCI]	.866025403784 (Floating business)
[DSP] 2	0.87 (Fixed two decimal places) (business mode)

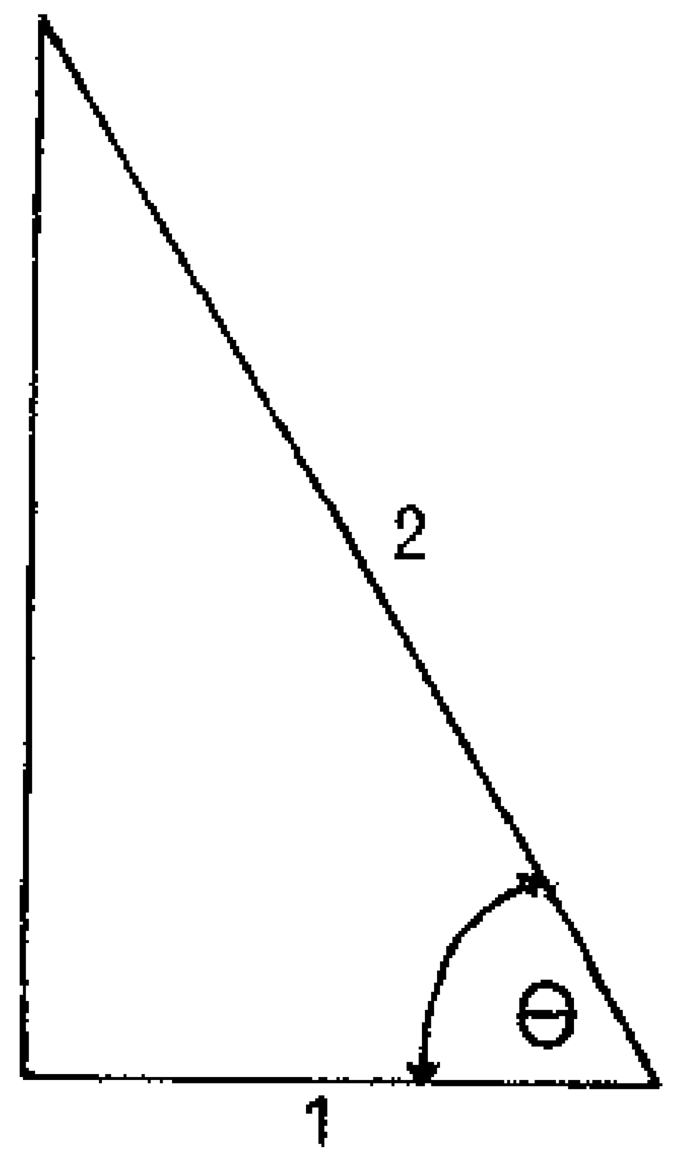


Figure 1.

To use the arc functions, press [INV], then press down the associated function key.

Example: To find Sin^{-1} 0.5.

KEY SEQUENCE	DISPLAY
[DSP] [INV] [RAD]	0.00
.5 [INV] [SIN]	30.00

If angle in radians is desired.

KEY SEQUENCE	DISPLAY
[DSP] [RAD]	0.00
.5 [INV] [SIN]	0.52

Using π [π]

π, 3.14159265359 is provided as a constant, press [DSP] whenever one needs in a calculation before executing the applicable operation.

Example: 1 Calculate 4 π

ENTER	DISPLAY
4 [ENT]	4.00
[DSP] [π]	3.14
[X]	12.57

Example 2. Find the volume of a cylinder with a 4-foot radius r, and height 12-foot.

Where A $= \pi r^2 h$

r = 4

h = 12

Solution:

KEY SEQUENCE	DISPLAY
[DSP] [π] [ENT]	3.14 (π)
4 [DSP] [INV] [√X]	16.00 (r^2)
[X]	50.27
12 [X]	603.19 (Volume of the cylinder).

Using Factorials

The [X!] allows you to handle combinations and permutations. To calculate the factorial of a displayed number just press [DSP] [X!]

e.g. Find the factorial of 8

KEY SEQUENCE	DISPLAY
8	8
[DSP] [X!]	40320.00

Example 1. It is required to seat 5 men and 4 women in a row so that the women occupy the even places. How many such arrangements are possible?

Solution: The required number of arrangements

$= 5^{P}5 \cdot 4^{P}4 = 5!\,4! = 2880$

KEY SEQUENCE	DISPLAY
5 [DSP] [X!]	120.00
4 [DSP] [X!]	24.00
[X]	2880.00

Example 2. A boy has five coins of a different denomination. How many different sums of money can be formed.

Solution: He can select either 1 out of 5 coins, 2 out of 5 coins, ... 5 out of 5 coins. Then the required number of sums of money is

$$5^{C}1 + 5^{C}2 + 5^{C}3 + 5^{C}4 + 5^{C}5$$

$$= \frac{5!}{4!} + \frac{5!}{2!3!} + \frac{5!}{3!2!} + \frac{5!}{4!} + 1$$

$$= 2 \cdot \frac{5!}{4!} + 2\,\frac{5!}{3!2!} + 1$$

KEY SEQUENCE	DISPLAY
[DSP] 0	0.
5 [DSP] [X!] [ENT]	120.
4 [DSP] [X!]	24.
[÷]	5.
2 [X]	10.
5 [DSP] [X!] [ENT]	120.
3 [DSP] [X!] [ENT]	6.
2 [DSP] [X!] [X]	12.
[÷]	10.
2 [X]	20.
[+]	30.
1 [+]	31. (Answer)

Logarithmic and Exponential Function

Corvus 500 computes both logarithmic and exponential functions as well as their inverse functions.

[Ln] is natural log (loge); takes log of value in display to base e (2.71828. . . . .)

e^x is antilog raise e (e=2.71828 . . . . . .) to the power of value in display, and can be obtained by pressing the [INV] [LN] Keys.

Example 1.

KEY SEQUENCE	DISPLAY
[DSP] 9	0.000000000 (If 9 digit display desired)
3.2 [Ln]	1.163150810

Example 2. Calculate e^4

KEY SEQUENCE	DISPLAY
4 [INV] [Ln]	54.60

Example 3. Calculate Log 1223

KEY SEQUENCE	DISPLAY
1223 [DSP] [Log]	3.09

To find Reciprocal and Square Root

Those two functions can be easily obtained by pressing down the [DSP] [$\sqrt{x}$] and [DSP] [1/X] respectively.

Example 1. Calculate $\sqrt{64}$

KEY SEQUENCE	DISPLAY
[DSP] 0	0
64	64.
[DSP] [$\sqrt{x}$]	8.

Example 2. Find 1/4

KEY SEQUENCE	DISPLAY
[DSP] 0	0
4	4.
[DSP] [1/X]	0.25

Example 3. Calculate

$$\frac{1}{\frac{1}{5} + \frac{1}{7}}$$

KEY SEQUENCE	DISPLAY
[DSP] 0	0
5 [DSP] [1/X]	0.2
7 [DSP] [1/X]	0.14
[+]	0.34
[DSP] [1/X]	2.94

Raising Numbers to Powers

[Y^X] is a two-number operation, used to raise a number to powers.

e.g. Calculate 4^6

KEY SEQUENCE	DISPLAY
4	4
[ENT]	4.00
6	6
[Y^X]	4096.00

Example 1. Assume a particle moves along a straight line according to the equation.

$$S = \frac{1}{2}t^4 - 6t$$

Determine its velocity and acceleration at t = 2 seconds.

Solution:

$$V = \frac{ds}{dt} = 2t^3 - 6 = 2 \cdot 2^3 - 6$$

$$A = \frac{dv}{dt} = 6t^2 = 6 \cdot 2^2$$

(t = 2)

KEY SEQUENCE	DISPLAY
2 [ENT] 3 [Y^X]	8.00
2 [X]	16.00
6 [−]	10.00 (Velocity)
2 [ENT] 2 [Y^X]	4.00
6 [X]	24.00 (Acceleration)

Hyperbolic Function

Hyperbolic function is achieved by depressing [HYP] key.

Example 1. Calculate Sinh 30 in degree.

KEY SEQUENCE	DISPLAY
[DSP] 0	0
[DSP] [INV] [RAD]	0.
30 [HYP] [SIN]	5.343237290 12

Example 2. Prove the following expression for value of X that are 0.5, 1, and 10.

$Cosh^2X - Sinh^2X = 1$

KEY SEQUENCE	DISPLAY
[DSP] 9	0.000000000
0.5	0.5
.	(Insert other values for X here)
[HYP] [COS]	1.127625965
[DSP] [INV] [√x]	1.271540317 (Squares contents of display register).
0.5	0.5 (Insert other values for X here).
[HYP] [SIN]	0.521095305
[INV] [DSP] [√x]	0.271540317 (Squares contents of display register).
[−]	1.000000000 (Proven for case one).

The cases of X = 1 and 10 are left to the user.

Percentage and Percentage Difference

The calculation of percentage and percentage difference problems can be simplified by using [DSP] [%] and [DSP] [Δ%] .

Example 1. What is the selling price including a 5% sales tax of a $3,500.00 automobile?

Solution: 3500 + 5% = ?

KEY SEQUENCE	DISPLAY
3500 [ENT]	3500.00
5	5
[DSP] [%]	175.00
[+]	3675.00

Example 2. If gasoline is sold for 32.9 cents/gallon one year and 52.4 cents/gallon the next. What is the % of the increase?

Solution: (52.4 − 32.9) % = ?

KEY SEQUENCE	DISPLAY
32.9 [ENT]	32.90
52.4	52.4
[DSP] [Δ %]	59.27

Example 3. If an automobile costs $175.00 to build, What would be its retail price if a 50% gross profit margin is maintained?

Solution:

KEY SEQUENCE	DISPLAY
1750 [ENT]	1750.00
50	50
[INV] [DSP] [%]	1750.00 (Gross profit margin)
[+]	3500.00 (Retail price)

Polar/Rectangualr Coordinate Conversion.

In order to convert two values X, Y representing the X, Y coordinates to polar r, θ cordinates (magnitude and angle respectively) one simply depresses [DSP] [→POL] the magnitude r will appear in X-register and angle θ will appear in the Y-register. Conversely, on converting r, θ to rectangular coordinate (x, y resp.); press [INV] [DSP] [→POL].

Example 1. Convert rectangular coordinates (4,3) to polar form with angle expressed in degrees. Since 3 is the Y coordinate and should be placed in Y register. Enter 3 first and then 4 the X coordinate.

KEY SEQUENCE	DISPLAY
[DSP] 0	0
[DSP] [INV] [RAD]	0.
3 [ENT]	3.
4 [DSP] [→POL]	5. (Magnitude)
[X↔Y] [DSP] 2	36.87 (Angle in degree)

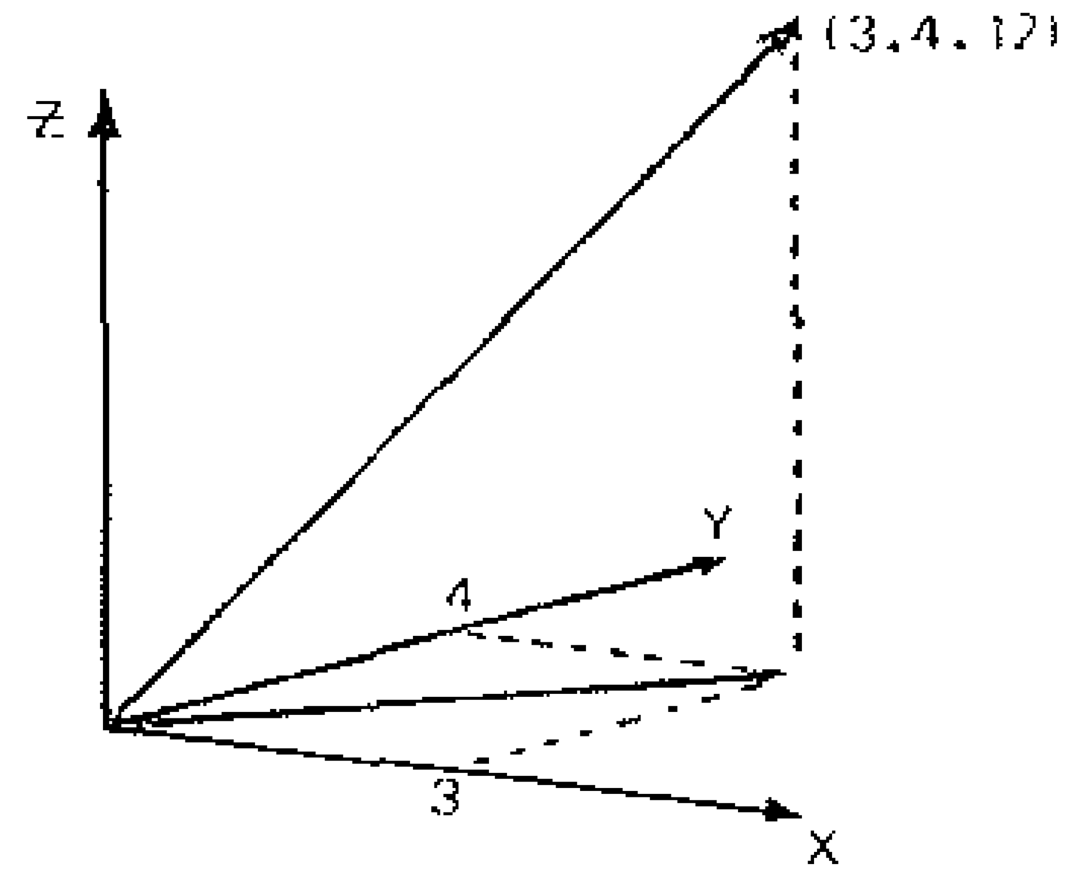
Example 2. Convert polar coordinates (8, 120) to rectangular coordinates.

KEY SEQUENCE	DISPLAY
[DSP] [INV] [RAD]	0.00
120 [ENT]	120.00
8 [DSP] [INV] [→POL]	–4.00 (X-coordinate)
[X↔Y]	6.93 (Y-coordinate)

Example 3. Convert polar coordinates (8, 2.094) which the angle expressed in radians to rectangular coordinates.

KEY SEQUENCE	DISPLAY
[DSP] [RAD]	0.00.
2.094 [ENT]	2.09
8 [DSP] [INV] [→POL]	–4.00 (X-coordinate)
[X↔Y]	6.93 (Y-coordinate)

Example 4. Find the azimuth, elevation and distance to the point (3, 4, 12).



KEY SEQUENCE	DISPLAY
[DSP] 0	0
4 [ENT]	4.
3	3
[DSP] [→POL]	5. (Distance to point below 3, 4, 12)
12	12
[X↔Y]	5.
[DSP] [→POL]	13. (Distance to the point 3, 4, 12)
[R↓]	67.3801350518 (Elevation in degress)
[R↓]	53.1301023539 (Azimuth)

Metric/U.S. Unit Conversion Constants

Several forms of Unit Conversion are provided, namely:

KEY SEQUENCE	FUNCTION
[C↔F]	Centigrades to Farenhiets
[LTR↔GAL]	Liters to Gallons
[CM↔IN]	Centimeters to Inches
[KG↔LB]	Kilograms to Pounds

The reverse conversion can be obtained by applying the [INV] key.

Example 1. How many inches are there to 1 cm?

KEY SEQUENCE	DISPLAY
1	1
[DSP] [CM↔IN]	0.3937

Example 2. How many cms are there to 0.3937 inches?

KEY SEQUENCE	DISPLAY
0.3937	0.3937
[DSP] [INV] [CM↔IN]	1.00

Example 3. What is the weight of a cubic foot of water? The density of water is 1 gram/cc at 4°C

KEY SEQUENCE	DISPLAY
12	12
[DSP] [INV] [CM↔IN]	30.48 (cm/ft)
3	3
[Y^X]	28316.85 (cc/ft^3)
1000	1000
[÷]	28.32 (Kg/ft^3)
[DSP] [KG↔LB]	62.43 (lb/ft^3)
[DSP] 9	62.427960579 (Ans.)

Recharing and AC Operation

The calculator should be turned OFF before plugging in the charger. It can be turned ON after the charger has been plugged into the power outlet. The calculator can be operated continuously from AC line if desired.

After 12 hours, a completely discharged battery will be fully charged shorter charge periods will reduce battery operating time. Three rechargeable AA batteries are provided with each calculator. Before operation, turn the power OFF, insert battery charger plug into the connector of the calculator and insert power plug of battery charger-into the power outlet.

IMPORTANT: Battery life is shortened by overcharging; Do not exceed the required charging time.

To replace batteries, simply turn off power switch, slide the battery-door latch, the battery door will open.

Appendix A

If a calculation contains an improper operation – say, division by zero – the display will be flashing unless [CLX] has been pressed.

The following are the improper operations:

FUNCTION	Illegal Arguements	Display (Flashing)
Y/X, 1/X	X = 0	+ 19.999999999 99
$\sqrt{X}$	X < 0	0. 00
X !	X < 0, or non-integer	0. 00
	X > 120	9.999999999 99
Ln X, Log X	X < 0	0. 00
Y^X	Y < 0	0. 00
	X > 100 1n10/1nY	9.999999999 99

	$X < 100$ 1n10/1nY	0.1-99
$\sqrt[X]{Y}$	$Y < 0$	0. 00
	$X <$ 1nY/1001n10	9.999999999 99
	$X > -$ 1nY/1001n10	0.1-99
e^X	$X \geq$ 1001n10	9.999999999 99
	$X \leq -$1001n10	0.1-99
10^X	$X \geq 100$	999999999 99
	$X \leq 100$	0.1-99
$Sin^{-1}X$, $Cos^{-1}X$	$\lvert X \rvert > 1$	0. 00
$Cosh^{-1}X$	$X < 1$	0. 00
$Tanh^{-1}X$	$\lvert X \rvert \geq 1$	0. 00

Note: Tan 90^{o} is not illegal but it does flash all 9's to indicate the infinite (∞).