TI-84 Skills for the IB Maths Studies

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If you have not already done so, upgrade to OS 2.55MP and PlySmlt2.

Sending and receiving an APP or program
To receive
LINK (2nd X,T,θ,n)
RECEIVE 1:
Receive ENTER

To send
LINK (2nd X,T;θ,n)
SEND C:Apps
CtlgHelp
ENTER (this selects the APP)
TRANSMIT
1: Transmit ENTER

To reuse a previous entry scroll up, press ENTER

To get to the start or end of a long expression or list, for example in Y=, key 2nd ◄ or ► as needed.

F1 the fraction template

Select $\frac{\Box}{\Box}$. Type your formula into it.

The template eliminates the need for puzzling out brackets in complicated fractions.

Examples

$$\frac{X-1}{X+1}$$

$$\cos^{-1}\left(\frac{4^2+5^2-2^2}{2*4*5}\right)$$

To convert a decimal to a fraction
0.375 MATH 1: Frac gives 3/8.

To simplify fractions
1371/3656 MATH 1: Frac gives 3/8.

The TI does not always give the exact value, for example X = 5.673546567E-12 as an output is an attempt by the TI to report "X = 0"; note the E-12 at the end.

Dimension error usually comes from having a STATPLOT on. Go to Y=.
If a Plot is highlighted, un-highlight it with ENTER.
If all else fails, MEM (2nd ENTER) 5 : Reset 2 : Defaults 2 : Reset always works.

Err: WINDOW RANGE means you set X (or Y) min bigger than max
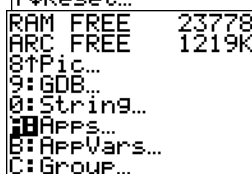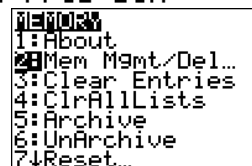
Applications
They are accessed by pressing the APPS button.

The TI-84 APPS allowed by the IB are:
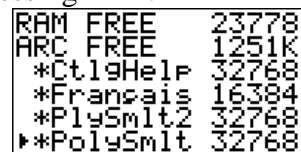PlySmlt2 – The Polynomial Root Finder and Simultaneous Equation Solver
Finance
Not needed, but allowed
CtlgHelp – Catalogue Help
Various language APPS
CBL/CBR

All other APPS should be deleted using
MEM (2ND +) 2:Mem Mgmt/Del A:APPS

Put the cursor in front of the APP to be deleted and pressing DEL.

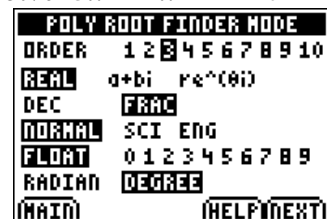## Plysmlt2 (**Polynomial Root Finder and Simultaneous Equation Solver Version 2**)
It has 2 programs
1: Polynomial Root Finder
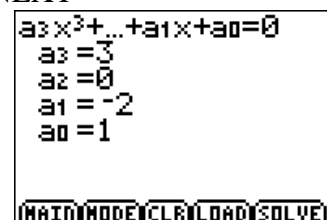2: Simultaneous Equation Solver

Polynomial Root Finder
The Polynomial Root Finder can find the roots (i.e. zeros, solutions) for any polynomial with real coefficients up to degree 10.
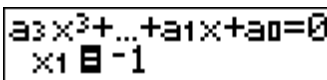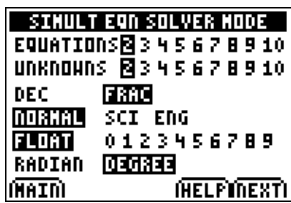*Solve $3x^3 – 2x + 1 = 0$*

NEXT

SOLVE

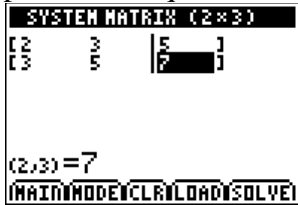The only real solution is x = -1.

Simultaneous Equation Solver
The Simultaneous Equation Solver can solve up to 10 unknowns and 10 equations simultaneously.
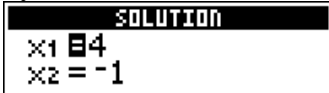*Solve $2x + 3y = 5$
and $3x + 5y = 7$*

NEXT

Type the two equations in.

Key SOLVE

The solution is x = 4 and y = -1.
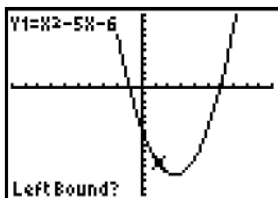
Find the Vertex of a Parabola (Maxima & Minima)

Find the vertex of $y = x^2 – 5x – 6$
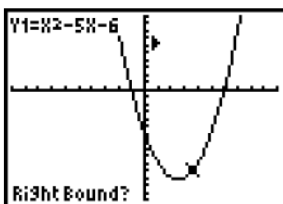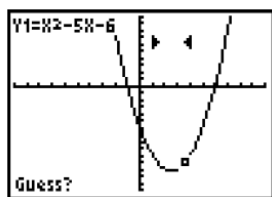
Type the Equation into Y=

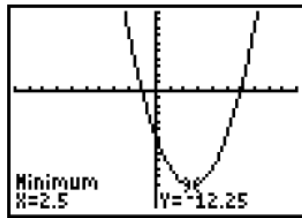GRAPH

2nd CALC

3: minimum

Move the cursor to the left of the vertex. ENTER

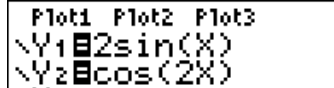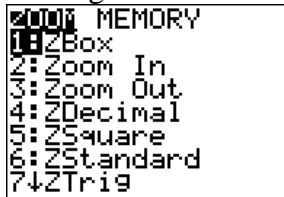Move the cursor to the right of the vertex. ENTER

ENTER

The vertex is (2.5, -12.25).

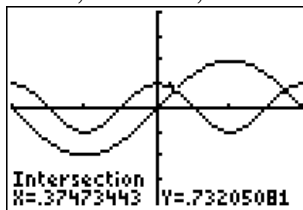# Intersections of two curves (solutions of equations)

Zoom Trig

2nd CALC

5: intersect

ENTER, ENTER, ENTER,

To store results from intersection or maximum, etc.

Keying [ENTER] will store the X and Y values of that point stored in variables X and Y respectively. Recall the x value with the X,T,θ,n button or with ALPHA X, Recall the y value with ALPHA Y.

Zeros (solutions of equations)
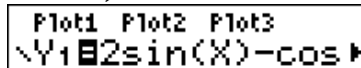
2nd CALC

2: zero

Left Bound
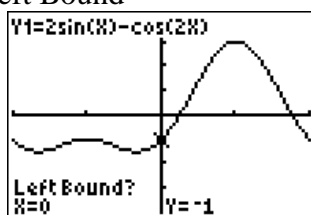
ENTER

Right Bound
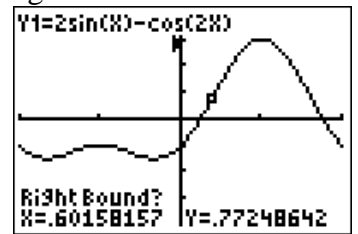
ENTER, ENTER
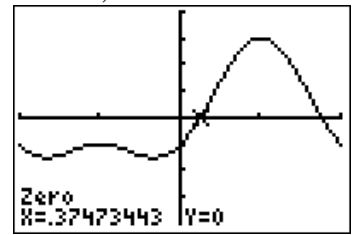
Mean and Standard Deviation

The number of bottles of water sold at a railway station on each day is given in the following table. [M08.2 A3B]

Day	0	1	2	3	4	5	6	7	8	9	10	11	12
Temperature (T°)	21	20.7	20	19	18	17.3	17	17.3	18	19	20	20.7	21
Number of bottles sold (n)	150	141	126	125	98	101	93	99	116	121	119	134	141

(a) *Write down*
(i) *the mean temperature;*
(ii) *the standard deviation of the temperatures.*

Go to STAT EDIT

Type your values into L1.
If you have frequencies, type them into L2.
(The example below does not use the above numbers.)

Go to STAT CALC 1-Var Stats
ENTER

2

If you just have values in L1 type
1-Var Stats L1
If you have values in L1 and
frequencies in L2
Type 1-Var Stats L1, L2
The mean is $\bar{x}$
The standard deviation is σx

```
1-Var Stats
 x̄=5.194444444
 Σx=374
 Σx²=2138
 Sx=1.658430353
 σx=1.646873206
↓n=72
```

The mean is $\bar{x}$
The standard deviation is σx.
The IB wants Q1, Q3, and the
median from a cumulative
frequency graph, so do not use the
TI-84 values.

```
1-Var Stats
↑n=72
 minX=1
 Q₁=4
 Med=5.5
 Q₃=7
_maxX=7
```

Regression & Correlation

Write down the correlation coefficient, r, for the variables n and T.

Turn on DiagnosticOn in
CATALOG

```
CATALOG        ▣
 DelVar
 DependAsk
 DependAuto
 det(
 DiagnosticOff
▶DiagnosticOn
 dim(
```

Go to STAT EDIT CALC
4:LinReg(ax+b)

```
EDIT CALC TESTS
1:1-Var Stats
2:2-Var Stats
3:Med-Med
4:LinReg(ax+b)
5:QuadReg
6:CubicReg
7↓QuartReg
```

ENTER

```
LinReg(ax+b)
Xlist:L₁
Ylist:L₂
FreqList:
Store RegEQ:Y₁
Calculate
```

```
LinReg
 y=ax+b
 a=3.071428571
 b=-2
 r²=.9877136752
 r=.9938378516
```

(d)   *The equation of the line of regression for n on T is n = dT −100.*
   (i)   Write down the value of d.

   d is "a" in the TI output

   (ii)   Estimate how many bottles of water will be sold when the temperature is 19.6°.

   Type Y1(19.6)
F4 accesses the Y1, etc. variables

```
         Y1 Y6
         Y2 Y7
         Y3 Y8
         Y4 Y9
         Y5 Y0
FRAC FUNC MTRX YVAR
```

Scatter Diagram
The following table shows the cost in AUD of seven paperback books chosen at random, together with the number of pages in each book.

Book	1	2	3	4	5	6	7
Number of pages (x)	50	120	200	330	400	450	630
Cost (y AUD)	6.00	5.40	7.20	4.60	7.60	5.80	5.20

Plot these pairs of values on a scatter diagram. Use a scale of 1 cm to represent 50 pages on the horizontal axis and 1 cm to represent 1 AUD on the vertical axis.   [M08.2 St2 R2B]
Go to STAT EDIT

```
EDIT CALC TESTS
1:Edit…
2:SortA(
3:SortD(
4:ClrList
5:SetUpEditor
```

Type the data in

```
L1     L2      L3    2
50     6
120    5.4
200    7.2
330    4.6
400    7.6
450    5.8
630    5.2
L2 ={6,5.4,7.2,4…
```

Go to STAT PLOT
Turn on Plot1
Choose Scatter ▦
Tell it the data is in L1 & L2

```
Plot1 Plot2 Plot3
On Off
Type: ▦ ⌁ ⊞
      ⊞·· ⊞ ⊞
Xlist:L₁
Ylist:L₂
Mark: ■  +  ·
```

ZOOM 9:ZoomStat

```
ZOOM MEMORY
5↑ZSquare
6:ZStandard
7:ZTrig
8:ZInteger
9:ZoomStat
0:ZoomFit
A↓ZQuadrant1
```
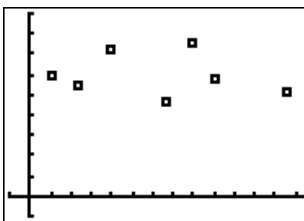
This sets the window so that
the data appears, but makes
odd choices

```
WINDOW
 Xmin=■8
 Xmax=688
 Xscl=1
 Ymin=4.09
 Ymax=8.11
 Yscl=1
↓Xres=1
```

Use Zoom to set to a more
sensible window size & scale

```
WINDOW
 Xmin=-50
 Xmax=700
 Xscl=50
 Ymin=-1
 Ymax=9
 Yscl=1
↓Xres=1
```

Key GRAPH

Chi-Squared
Go to MATRIX EDIT

```
NAMES MATH EDIT
1:[A]  2×3
2:[B]  3×3
3:[C]  3×3
4:[D]  2×1
5:[E]  ...
```

Type your Observed values into a matrix.

```
MATRIX[A]  2×3
[ 2    3    7  ]
[ 1   -4   20  ]
```

Go to STAT TESTS C: χ²-Test
Using MATRIX NAMES ENTER,
enter the name of matrix with the

3

Observed values and the matrix where you want the Expected values

```
X²-Test
 Observed:[B]
 Expected:[C]
 Calculate Draw
```

Type ENTER
You can view the Expected values

```
[C]
[[6.25 7.10 9.6…
 [7.06 8.02 10.…
 [8.69 9.88 13.…
```

You can view χ^2 , p & df values
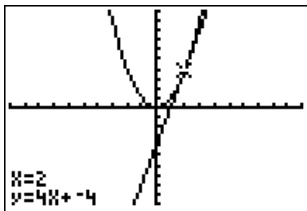
```
X²-Test
 x²=2.490374611
 P=.6463601936
 df=4
```

Find the tangent line

Put x^2 in Y=
In GRAPH
2nd Draw5:Tangent
X= 2


```
X=2
y=4X+-4
```

Interest (or inflation) Rates

Go to APPS Finance TVM Solver (TVM stands for Time Value of Money)
The logic of the TVM Solver is that you fill in everything you know (interest rate, number of years, amount invested, number of times compounded per year, value after n years, etc.),put the cursor on which one you do not know and press ALPHA SOLVE.

N is the number of years
I% is the interest rate
PV (Present Value) is the amount invested. Enter it as a negative number!
FV (Future Value) is the amount after N years. This is often the unknown.

C/Y (Compounding periods per Year) is the number of times compounded per year
Set PMT (he Periodic payment) to 0 and P/Y (Payments per Year) to 1. We do not use these variables.

$600 is invested at 2.75% compounded annually for 4 years. What is now in the bank?
Enter the data. Put the cursor on FV and press ALPHA SOLVE.

```
N=4
I%=2.75
PV=-600
PMT=0
•FV=668.7727556
P/Y=1
C/Y=1
PMT:    BEGIN
```

The answer is $669

Calculate the number of years to double
Put 1200 in FV
Put the cursor on N and press ALPHA SOLVE.

```
•N=25.55035862
 I%=2.75
 PV=-600
 PMT=0
 FV=1200
 P/Y=1
 C/Y=1
 PMT:    BEGIN
```

The answer is 26 years.

$600 doubles in 20 years compounded annually. Find the interest rate.
Enter the data. Put the cursor on I% and press ALPHA SOLVE.

```
N=20
•I%=3.526492384
 PV=-600
 PMT=0
 FV=1200
 P/Y=1
 C/Y=1
 PMT:    BEGIN
```

The answer is 3.53%.

$100 is invested at 12% per annum, compounded monthly. How much is there after 1 year?
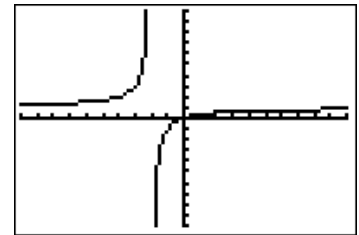Enter the data, including C/V = 12.

```
N=1
I%=12
PV=-1100
PMT=0
•FV=1239.507533
P/Y=1
C/Y=12
PMT:END  BEGIN
```

The answer is $1240

Horizontal and Vertical Asymptotes

Sketch a graph of $y = \dfrac{x}{2+x}$

The vertical asymptotes can be found from TABLE

```
X      Y₁
-3     3
-2     ERROR
-1     -1
0      0
1      1/3
2      1/2
3      3/5
X=3
```
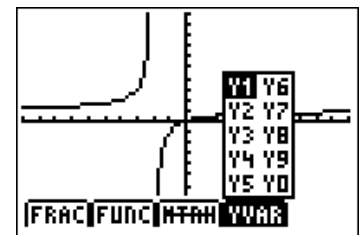
The x corresponding to "ERROR" in the Y1 column is a vertical asymptote.
The vertical asymptote is x = -2.

ALPHA F4 ENTER will give you Y1.

Put in a big value of x

```
Y₁(10000000000)
                1
```

The horizontal asymptote is y = 1.

4