TI-84 Skills for the IB Maths HL

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

To reuse a previous entry scroll up.

To get to the start or end of a long expression or list

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

MATH 1: Frac converts a decimal to a fraction
0.375 ►Frac gives 3/8.
and simplifies fractions 1371/3656
1371/3656►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.

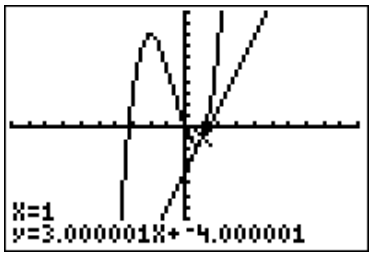
Use 1-Var Stats for mean & SD, but NOT for Q1 & Q3.

Graph composite functions using Y3 = Y1(Y2)

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.

Use CALC to find
Zeros (solutions of equations)
Max & min
Intersections of two curves
Numerical derivative at a point
Definite integral, because it's more certain than fnInt in the home screen

Use DRAW Tangent(to find the equation of a tangent line at x = 1.

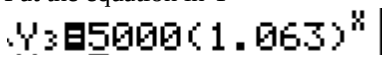


So the tangent line is y = 3x – 4

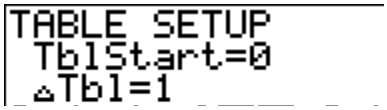
In DISTR learn to use:
normalcdf(
invNorm
invT (Statistics Option only)
χ^2CDF (Statistics Option only)
binomPDF
binomCDF
PoissonPDF
PoissonCDF

Use TABLE to solve (specimen 2005 H1 # 7) $5000 is invested at 6.3%. The value of the investment will exceed $10 000 after n full years. Calculate the minimum value of n.

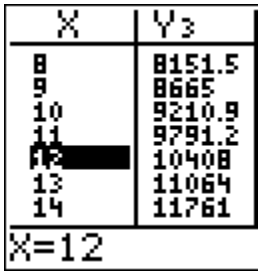
Put the equation in Y=



Set TblStart = 0 and ΔTbl =1 with TBLSET



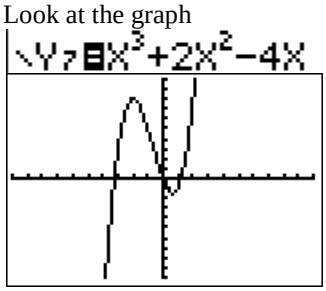
scroll to Y > 10000



So n = 12

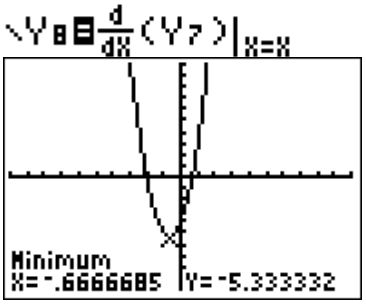
Find the coordinates of the inflection point of $y = x^3 + 2x - 4$

Look at the graph

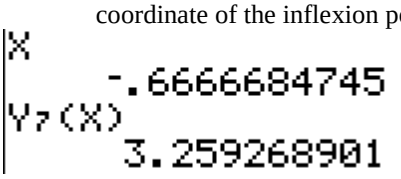


The inflexion point seems to be about x = -1.

Graph the derivative and find its max or min, which gives the inflexion point. If it graphs too slow, set Xres=4 in WINDOW.



The x-value is automatically stored in "x". In the home screen you can find the y-coordinate of the inflexion point.



So the inflexion point is (-2/3, 3.26).

MATRIX

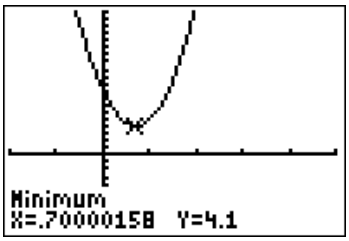
Solve a matrix equation using $X = A^{-1}B$
Find determinant with detA

The line L is given by the parametric equations $x = 1 - \lambda$, $y = 2 - 3\lambda$, $z = 2$. Find the coordinates of the point on L which is nearest to the origin. (S05 H1 # 16)

Type the (square of the) distance formula into Y=

$Y_6 = (1-X)^2+(2-3X)^2$

Find the minimum.



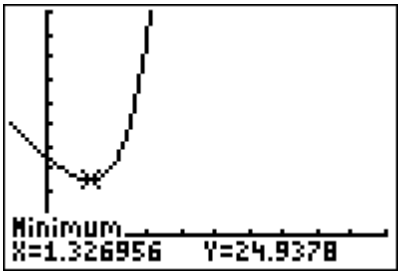
So λ = 0.7. Put this back into the parametric equations.

The point B(a, b) is on the curve f (x) = x² such that B is the point which is closest to A(6, 0). Calculate the value of a. (N02 H1 # 17)

Type the (square of the) distance formula into Y=

$Y_9 = (X-6)^2+(X^2)^2$

Find the minimum.



So a = 1.33.

Solve $\int_0^m \frac{dx}{2x+3} = 1$

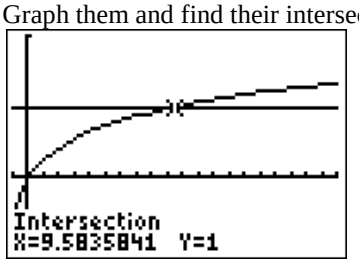
Set Xres = 4 (or more) or it takes too long to graph.

Type both sides of the equation into Y=

$Y_4 = \int_0^X (1/(2X+3))$

$Y_5 = 1$

Graph them and find their intersection.



So m = 9.58

Find μ & σ.

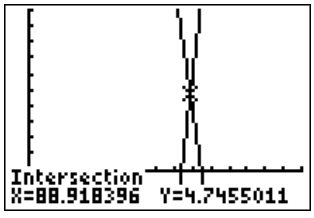
P(x < 84) = .15. P(x > 95) = .1. Find μ & σ.

$\frac{x-\mu}{\sigma}$ = InvNorm(probability). Solve this for σ. Call σ "y". Call μ "x". Type this into Y=.

$Y_1 = \frac{84-X}{\text{invNorm}(.15)}$

$Y_2 = \frac{95-X}{\text{invNorm}(.9)}$

Find the intersections.



So μ = 88.9, σ = 4.75

Use rref(to find Intersections of linear equations:

Example Solve (N02 H2 #2A) with λ = 5

$$\begin{pmatrix}1&1&2\\1&2&1\\2&1&5\end{pmatrix}\begin{pmatrix}x\\y\\z\end{pmatrix}=\begin{pmatrix}3\\4\\\lambda\end{pmatrix}$$

$$\text{rref}\left(\begin{bmatrix}1&1&2&3\\1&2&1&4\\2&1&5&5\end{bmatrix}\right)\to\begin{bmatrix}1&0&3&2\\0&1&-1&1\\0&0&0&0\end{bmatrix}$$

So the solution is x = 2 – 3z, y = 1 + z, z = z

Use Plysmlt2 to find Intersections of linear equations:

Example Solve (N02 H2 #2A) with λ = 5

SYSTEM MATRIX (3×4)

$$\begin{bmatrix}1&1&2&3\\1&2&1&4\\2&1&5&5\end{bmatrix}$$

SOLUTION SET

$x_1 = 2-3x_3$

$x_2 = 1+x_3$

$x_3 = x_3$

So the solution is x = 2 – 3z, y = 1 + z, z = z

Graphing the Inverse with DrawInv

Put a graph in Y1

Quit (Go to the home screen)

Key 2nd PRG (DRAW)

Key 8:DrawInv(Y1

Graph the second derivative

Put a graph in Y1

In Y2 Key MATH MATH 8:nDeriv(Y1,x,x)

In Y3 Key MATH MATH 8:nDeriv(Y2,x,x)

The second derivative of Y1 is graphed

This is slow, so in WINDOW set Xres = 8. This plots only every 8th pixel

Storing an answer

You can also store a result to a variable, e.g. A. with the STO button.

Example Store √10 to T and then recall it.

$\sqrt{(10)}\to T$ 3.16227766

T 3.16227766

How to store results from intersection or maximum, etc.

Suppose you have found the (x, y) coordinates of an intersection or any function in the [SECOND][CALC] menu that gives you a specific point on the graph and now need to manipulate the numbers further. 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.

Do not use TRACE & ZOOM

Do not use TRACE &/or ZOOM to find the intersections and intercepts. TRACE skips from one pixel element to the next. If the x-value of a pixel

element happens to be exactly the x-value of an intercept or intersection, you will get the right answer. Otherwise the closest pixel element will almost certainly not be correct to 3 significant figures. ZOOM will allow you to zoom in on an intercept or intersection. Eventually you will zoom in enough that TRACE will give enough significant figures, but this is very clumsy and time consuming compared to using CALC

Determine a numerical derivative with nDeriv

Key MATH 8: nDeriv(expression,variable,value[,ε]).

Example Find $\frac{d(x^2-2x+3)}{dx}$ at x = 4

Key MATH 8: nDeriv(x²-2x+3, x, 4) which gives 6. An analytical derivative (e.g. 2x - 2 in this example), cannot be found with the TI-84.

Determine a numerical derivative with GRAPH

Graph your expression, key 2nd CALC 6: dy/dx, key the x value at which you want the derivative and key ENTER.

Less Useful Stuff

Restricting the Domain in Y=

If you want to restrict the domain of a function displayed in Y=, divide by the restricted domain.

Example Restrict the domain of f(x) = 3x² - 4 to x ≥ 0.

Key Y1 = (3x² - 4) ÷ (x ≥ 0).

Example Restrict the domain of f(x) = x²to 0 ≤ x ≤ 5.

Key y1 = x² ÷ (0 ≤ x AND x ≤ 5). The brackets are required.

The logical operators ≠, ≥, etc. are in 2nd TEST TEST. The logical operators "AND", "OR", etc. are in 2nd TEST LOGIC.

Example Restrict the domain of f(x) = (x - 2)² - 4 to 0<x.

Key y1 = ((x-2)²-4) * (0<x). Use 2nd FORMAT AxesOff to see the y = 0 part. Note also the false line which is drawn connecting the two segments.

To Graph Piecewise Functions

Example graph f(x) = x, x ≤ 0
x², x > 0

There are two ways.

1) Use the method described above for limiting the domain and graph two (or more) equations simultaneously.

Key y1 = x ÷ (x ≤ 0)
y2 = x² ÷ (x > 0)

2) Multiply the pieces by zero and add them in one equation. This is the better option because in this case you do **not** get a line on the x-axis and because TABLE is easier to use since there is only one graph.

Key y1 = x (x ≤ 0) + x² (x > 0)

Example Graph f(x) = x + 3, x ≤ 0
3, 0 < x ≤ 2
2x – 1, x > 2

Y1 = (x + 3)(x≤0) + 3(x>0)(x≤2) + (2x – 1)(x>2)

Factoring Polynomials

The TI-84 can't factor polynomials, but it can still give you the answer by giving you the roots.

Example: Factor x² - 3x - 4

In Y= key Y1 = x² - 3x - 4 and GRAPH it.

By using 2nd CALC Zero get the roots, which are 4 and -1.

This means that x² - 3x - 4 factors as (x-4) (x+1)

Example: Factor 10x³ - 9x² - 13x + 6

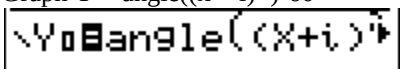
2nd CALC Zero gives x = 0.4, 1.5 and -1, which means that

10x³ - 9x² - 13x + 6 factors as a(x - 0.4) (x - 1.5) (x + 1), where a is 10, because 10 is the coefficient of x³.

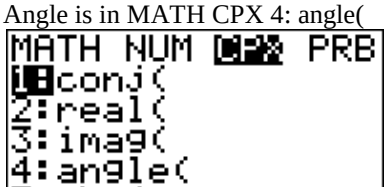
Use angle(to find arg(z)

Example Given that $z=(b+i)^2$, where *b* is real and positive, find the exact value of *b* when $\arg(z)=60^\circ$. (M01 H1 # 14)

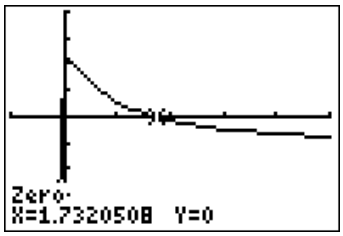
Graph Y = angle((x + i)²)-60



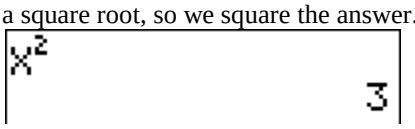
Angle is in MATH CPX 4: angle(



Find the zero



But they ask for the exact value. We are hoping that it is a square root, so we square the answer.

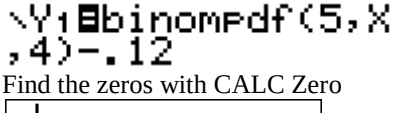


Voila! The answer is $\sqrt{3}$.

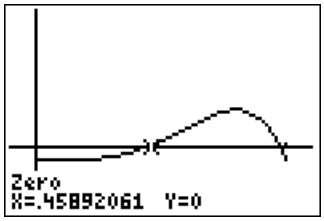
Graph Binomialcdf

Example (M01 H1 # 15) *X* is binomial random variable, where the number of trials is 5 and the probability of success of each trial is *p*. Find the value of *p* if P(X=4) = 0.12

Graph it. "x" is probability so set the window -0.1 < x < 1.1



Find the zeros with CALC Zero



p = 0.459 (and 0.973).