# Casio 9860 Self-Guided Instructions – RUN Mode

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## Main Buttons:

**MENU** – This brings up the menu screen **SET UP** – Most modes have a set up. Become familiar with SET UP. If anything is 'not quite right' on the screen ie something isn't showing when it should, or something is showing that needs turning off then SET UP is the place to go.

**EXIT** – The 'Back out' button, this will take you back to the previous screen

**EXE** – The 'Execute' button. Also the 'Equals' button.


**REPLAY (Joy Stick/Arrows)** – up-down-left-right … this button allows you to navigate around the screen

**OPTN** – more options appear at the press of OPTN, most notably Time-Degrees settings and Probability keys.

**DEL** – Delete button. It deletes the value to the left of the cursor **INS** – Insert button allows you to insert numbers, letters, symbols etc into, for example, formulae

**SHIFT** – Accesses the 'yellow' keys

**ALPHA** – Access the letters when needing to type formulae
**SHIFT-ALPHA** – Locks on the ALPHA Function. Handy for typing words as headings, eg in STAT and S-SHT

## Using the Scientific Calculator Mode (RUN):

Press **MENU** and arrow to **RUN** as shown in Fig1.
Press **EXE**

NOTE: There are 2 ways that numbers and commands can be entered on the screen – 'Line' and 'Math'

## Perform the following calculations in RUN mode (Input Mode = Line):

Press **SET UP (SHIFT MENU)** and with the **cursor over Input Mode** ensure it is set to Line. If not, **press F2**

1) $\sqrt{16}$
2) $\sqrt[3]{27}$ Note: Cube root is above the ( button.
3) $\sqrt[6]{34}$ (**6 SHIFT ^ 34**) ANS = 1.8 2sf

## Using the EXP button:

IMPORTANT: Using a calculator can be problematic for students. The next exercises illuminate the problems.
**Common mistake No.1.** Enter the following question as it reads ( without using the EXP button; without brackets)

4a) $2.3 \times 10^{7} \div 4.9 \times 10^{-13}$ (**2.3 x 10 ^ 7 ÷ 4.9 x 10 ^ -13**) (FigA)

**To correct the mistake:** Insert brackets - **use left and right arrows** to move cursor and insert the brackets (FigB)

4b) $2.3 \times 10^{7} \div (4.9 \times 10^{-13})$ (FigB)

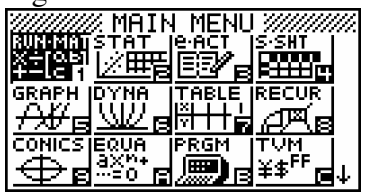
**Using the EXP button correctly:**

4c) $2.3 \times 10^{7} \div 4.9 \times 10^{-13}$ (**2.3 EXP 7 ÷ 4.9 EXP -13 EXE**) (FigC)

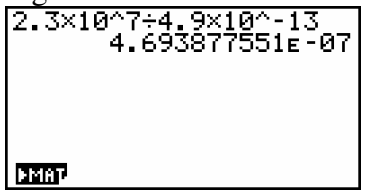
**Common mistake No.2** (for example) when entering $2.3 \times 10^{7}$ some students enter 2.3 x 10 EXP 7!! This is $2.3 \times 10^{8}$
The above points are worth highlighting to students to ensure they understand the need for brackets when dealing with scientific notation if they don't use the EXP button … and therefore to promote the use of the EXP button. You might want to 'nickname' the EXP button 'the-times-ten-to-the-button'.

Now answer: 5) $(7 \div 2.7)^{34} + 2.3 \times 10^{14} - \sqrt[4]{93.1}$
Note that the previous few operations can be viewed on the screen. (Fig2)

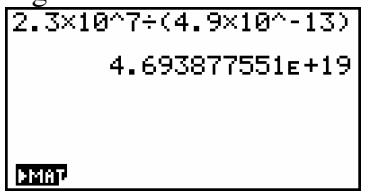
Fig1




FigA




FigB




FigC

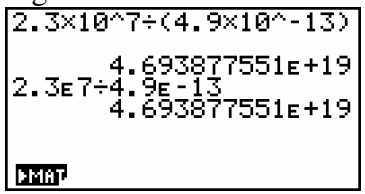
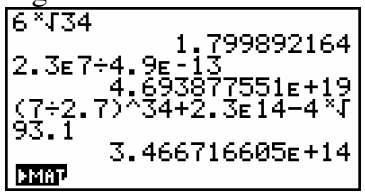



Fig2



## Editing an operation on the screen in line mode:

What if we had made a mistake in the last question? What if the last number in the line was meant to be 903.1 instead of 93.1. We do not need to write out the whole line again!

**CHOICE: Press AC and arrow up 1 space Now press right arrow until the cursor is between the 9 and the 3. Enter zero.** (Fig3)

Now **EXE.** (Fig4)

This is a particularly beneficial facility.

## Perform the following calculations in RUN mode (Input Mode = Math):

Press **SET UP (SHIFT MENU)** and with the **cursor over Input Mode** ensure it is set to Math. If not, **press F1**

Math Input works a little differently to Line Input but has a more mathematical layout. See if you can perform the same calculations with Math Input

1) $\sqrt{16}$

2) $\sqrt[3]{27}$ Note: Cube root is above the (

3) $\sqrt[6]{34}$ **Be Careful!! …..** (**SHIFT ^ 6 arrow right 34 EXE**) ANS = 1.8 2sf

4) $2.3 \times 10^{7} \div (4.9 \times 10^{-13})$ (**2.3 EXP 7 ÷ 4.9 EXP -13**) ANS = $4.694 \times 10^{19}$ 4sf

5) $(7 \div 2.7)^{34} + 2.3 \times 10^{14} - \sqrt[4]{93.1}$ **Be Careful!! ….. after entering ^ 34 you need to arrow right to drop down from the index line!!**

ANS = $3.467 \times 10^{14}$ 4sf (Fig5)

## Editing an operation on the screen in math mode:

Again, if we had made the same mistake in the last question we need to edit it efficiently. Again we will change the 93.1 to 903.1 Simply **arrow up 2 places** until the cursor is over the required line (Fig6)

Now **press right arrow** until the cursor is between the 9 and the 3 and enter zero (Fig7)

Now **EXE.** (Fig8)

**NOTE: The next sections are demonstrated in Line Mode. For your screen to look like these screens go to SETUP (SHIFT MENU) and change the Input Mode to Line.**

Fig3

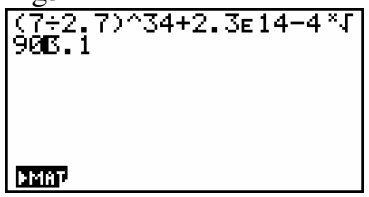



Fig4

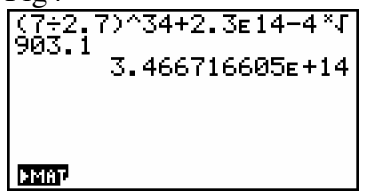



Fig5

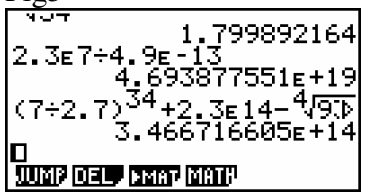



Fig6

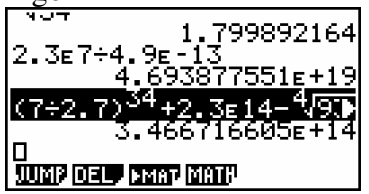



Fig7

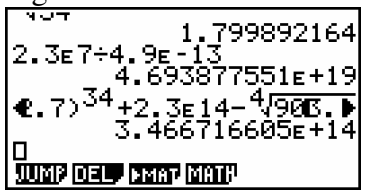
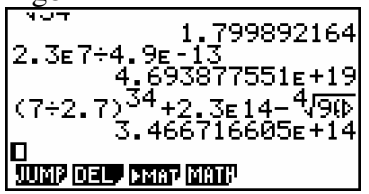


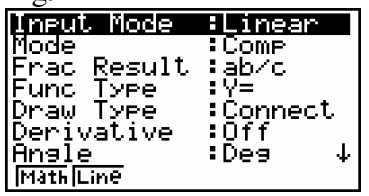

Fig8



# The SET UP:

Most menus have a set up.
With RUN executed (ie you are inside RUN mode) press **SHIFT MENU** and the screen in Fig9 will appear.

Fig9



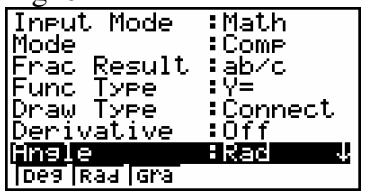

We will consider the more important options:

- Angle: scroll down to **Angle and use F1, F2 and F3** to change between Deg, Rad and Gra

**Choose Rad.** (Fig10)
Now press **EXIT** to return to the main screen.
NOTE: The default setting is Radians. This means that when the calculator is reset for Assessment tasks the calculator will be in Radians. Therefore students need to be very familiar with the SET UP function!

1) Find cos 3.1 radians ANS = -0.999 (3sf)
2) Find sin 27 degrees ANS = 0.45 (2sf)
3) Find tan 2.3 grades ANS = 0.036 (3sf)

Fig10




- Display: From the SETUP screen scroll to Display (Fig11)

**Fix:** Fixing decimal places. NOTE: Although arguably this is a function that students neither need nor should be encouraged to use, it is necessary when generating random numbers.
To observe the effect of Fix we will firstly leave Fix off.
Choose **Norm (F3)** once or twice to select Norm1 (Fig11)
Press **EXIT, then AC/ON** to clear the screen.
Enter **7 ÷ 9 EXE** (Fig12)

Fig11

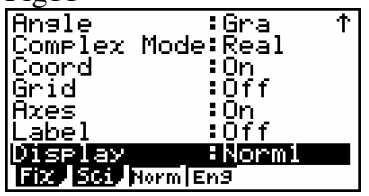
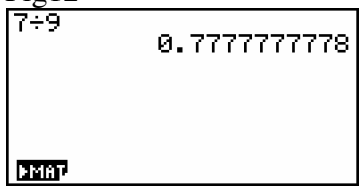
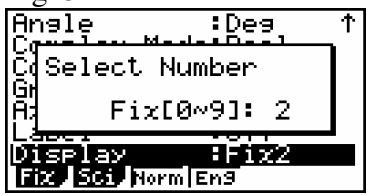



Fig12




Now let's fix the answer to 2 decimal places.
Go to **SET UP, arrow up 1 place, choose Fix (F1), press 2** (Fig13)

Fig13



Press **EXE**
Now **EXIT**
Because 7 ÷ 9 is still on the screen press **EXE** to calculate 7 ÷ 9 again.
The result is to 2 decimal places (Fig14)

**Scientific Notation:** (setting the number of significant figures):
Let's read 7 ÷ 9 in scientific notation to 1 significant figure.
Go to **SET UP**
Place the cursor over **Display**
**Press Sci (F2) enter 1** (Fig15)

Press **EXE, then EXIT.**
Press **EXE** again to enter 7 ÷ 9 (Fig16)

Let's read this to 3 significant figures.
**Repeat** the above operation but choose 3 sf.and execute 7 ÷ 9 (Fig17)

## Normal 1 and Normal 2:

Clear the screen using **AC/ON** and enter $3 \div 2 \times 10^{9}$ as in Fig18
(The answer of course is to 3 sig figs according to the SET UP)

Now lets see the difference between Norm 1 and Norm 2
Go to **SET UP, scroll up to Display**
Use **F3** to select between Norm 1 and Norm 2.
Choose **Norm 1.**
**EXIT** and press **EXE** Note the answer is in scientific notation to 2 sf. (Fig19)

Fig14

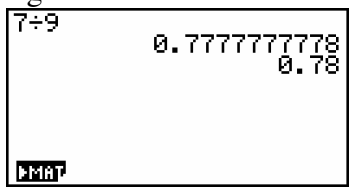



Fig15

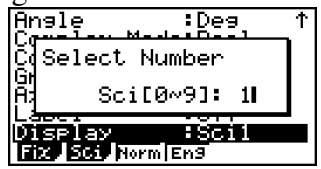



Fig16

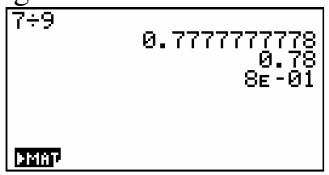



Fig17

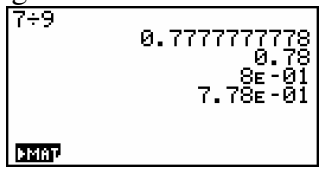



Fig18

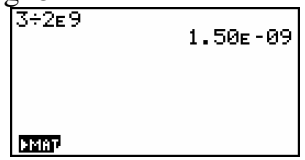
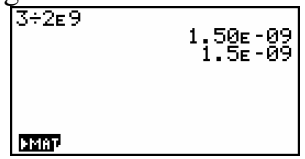
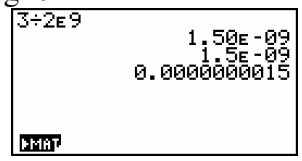



Fig19



Now repeat choosing **Norm 2**. (Fig20)
Note the answer is given as a decimal. In summary, where the answer is less than 0.01 Norm 1 will put it in Scientific Notation. Norm 2 on the other hand will put the answer in decimal form where possible.

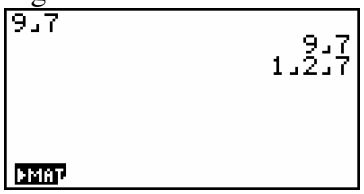
Fig20




- ## Fraction Result:

Let's inspect the different fraction displays.
Go to **SET UP** scroll down to **Frac Result and choose d/c (F1).**
**EXIT** then Clear screen with **AC/ON.**
**Enter 9 ab/c 7**, then **EXE** (top half of Fig21)
Now go to **SET UP** and change Frac Result to **ab/c.**
Press **EXIT then EXE.** (Fig21)

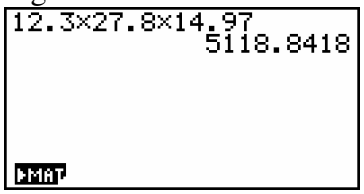
Fig21




### Changing from Fractions to Decimals:

With the above screen showing, flick between fraction and decimal using **F-D button.**
Try this with the d/c setting.

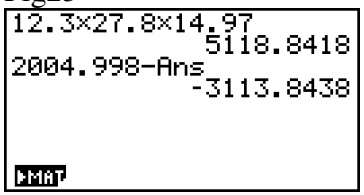
Fig22




# The Answer (ANS) Key:

This ANS is an extremely beneficial key with which students need to be familiar. No different to the ANS key on a scientific calculator but it is surprising to discover students who haven't been using it.
Quite simply, if the first part of a question requires the following calculations: 12.3 x 27.8 x 14.97 (Fig 22)

Fig23



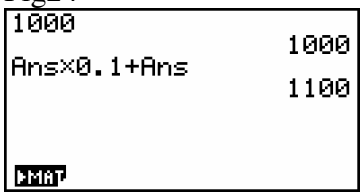

… and if the second part of the question requires the first previous result to be subtracted from 2004.998 then simply enter **2004.998 - Ans (SHIFT (-))** (Fig 23)
Importantly this saves rounding off in the middle of a solution.

## Compound Interest with the Ans Key:

Let's investigate a compound interest scenario with a principal of $1000 and a pa Compound Interest Rate of 10%
Clear the screen with **AC/ON**
If we wanted to calculate the Future Value after 5 years we could just use the formula. But let's use the Ans key cleverly.
**Enter 1000 and press EXE**

**Enter Ans x 0.1 + Ans EXE** (Fig 24)

Fig24



Now **keep pressing EXE** (Fig 25)

# Time / Deg-Min-Sec:

The Angle/Time button is accessed through the OPTN key

1) Find x to the nearest minute if sin x = 0.72

Firstly check the calculator is set to degrees. **SHIFT MENU scroll to Angle F1** (Fig 26)

Press **EXIT**

**SHIFT Sin 0.72 EXE** (Fig 27)

Now, to convert to Degrees, Minutes, Seconds:

**Press OPTN F6 ANGL (F5) F5** ANS: 46deg 3min 16.13seconds (Fig 28)

Note that on this screen F4 is the 'enter' button and F5 is the 'recall' button.

2) Find the cos of 27 deg 13 min 28 sec

Let's practise finding our way into the Angle button so firstly get back to the home screen by pressing **EXIT EXIT**

**Press OPTN ▷ (F6) ANGL (F5)**

Now we have the DMS button on display.

**Press Cos 27 F4 13 F4 28 F4 EXE** (Fig 29)

3) What time is 4hr 27min prior to 1:13pm?

Back out to practise getting to the ANGL button again (**EXIT, EXIT**) and **press AC** to clear the screen

Press **OPTN ▷ (F6) ANGL (F5)**

Now **enter 13 F4 13 F4 - 4 F4 27 F4 EXE**

To read the answer in HMS **press F5** (Fig 30)

ANS: 8:46 am

Fig25

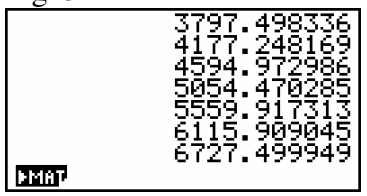



Fig26

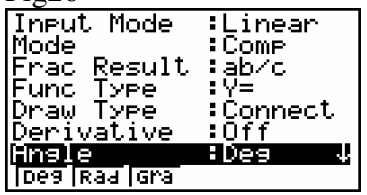



Fig27

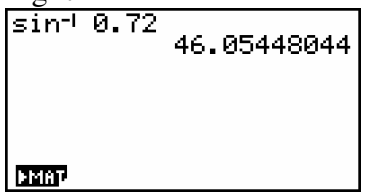



Fig28

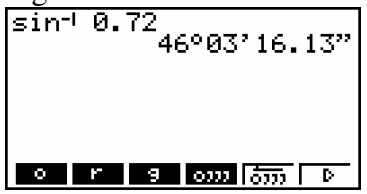



Fig29

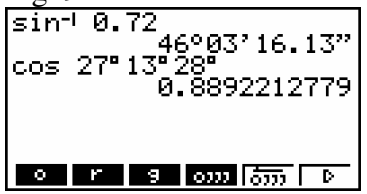
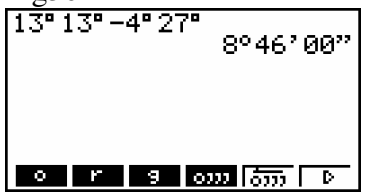



Fig30



4) What time and day is 11hr 48min 15sec prior to 3:37:04 am on a Saturday?
The easy way to answering this, given we know the day will be Friday is to add 24 hours to 3:37:04 ie = 27:37:04
Assuming we know how to get to the ANGL button now we won't EXIT this time.

**Enter 27 F4 37 F4 04 F4 - 11 F4 48 F4 15 F4 EXE**
Then press **F5** to convert to HMS.
ANS: 3:48:49 pm Friday (Fig 31)

# The Probability Button:

The Probability button is on the OPTN key
1) How many ways can a committee of 3 people be chosen from 12 people? … ie 12 C 3
Clear the screen and **EXIT** twice to get back to the home screen.
Press **OPTN** ▷ **(F6) PROB (F3) 12 F3 3 EXE** (Fig 32)

2) How many ways can a committee of President, Vice President and Secretary be chosen from 12 people? Ie 12 P 3
Enter **12 F2 3 EXE** (Fig 33)

3) What is 12! ?
Enter **12 F1 EXE** (Fig 34)

## Generating Random Numbers:

The random number button is part of the Probability suite, therefore accessed through OPTN.
Exit twice and clear the screen.
Press **OPTN** ▷ **(F6) PROB (F3)**
The random number key is Ran# (F4).
Press **Ran#** and then **EXE** repeatedly to see what happens. (Fig 35)
The calculator generates random numbers between zero and 1. Pity about all those decimal places!!

Let's fix the calculator to one decimal place.
**Press SET UP (SHIFT MENU) scroll up 1 to Display**
**Press Fix (F1) 1** (Fig 36)
**EXE.**

Fig31

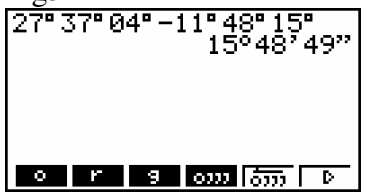



Fig32


Fig33


Fig34


Fig35

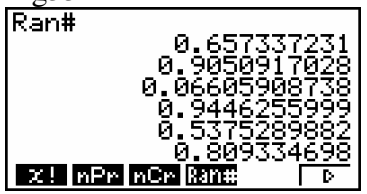
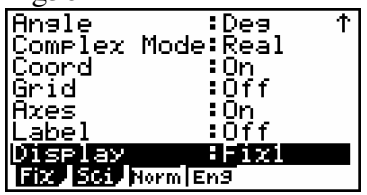
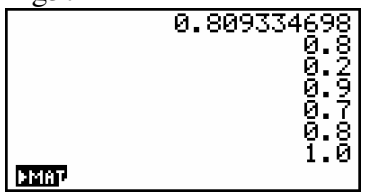



Fig36



Press **EXIT**
Now **press EXE repeatedly** (Fig 37)

Fig37




Generating Random Whole Numbers Between Zero and 10:
In SET UP change the **Fix to zero** decimal places (as above)
Press **Ran# x 10 the EXE repeatedly** (Fig 38)

Fig38

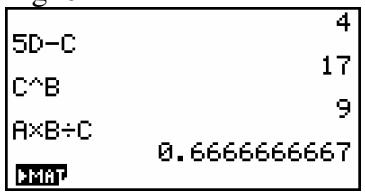

# Utilizing the Memory Function:

Numbers can be assigned to any of the letters using the → key (above AC/ON)
We will assign 1 to A, 2 to B, 3 to C and 4 to D
**Press 1 → ALPHA A EXE 2 → ALPHA B EXE 3 → ALPHA C EXE 4 → ALPHA D EXE** (Fig 39)

Fig39


Now calculate the following:
1) 5D – C
2) C ^ B
3) A x B ÷ C (Fig 40)

Fig40



# Logs, Absolute Values, Calculus, Sum of Terms:

For this next section of operations we need to be in Math Input mode. All the questions can be calculated mentally so you can check the validity easily.

Go to **SETUP and choose Input Line Math** (Fig41)

**EXIT**

To delete the entries on the screen follow the prompts **(F2 F2 F1)**

## Logs:

Start at the home screen in Math Input Mode (Fig42)

**Press MATH (F4) then Log ab (F2)** (Fig43)

## Questions:

1) $\log_3 81$ **Press F2 enter 3 arrow right 81 EXE** (Top of Fig44)

2) $\log_{10} 100$ **Press F2 enter 10 arrow right 100 EXE** (Fig44)

3) $\log_{10} 0.1$

4) $\log_2 \left(\frac{1}{8}\right)$ (Fig45)

## Absolute Value:

To clear the screen: **EXIT F2 F2 F1**

Questions:

1) |-3| **Math Abs - 3 EXE**

2) |-6 x 8| **Abs - 6 x 8 EXE** (Fig46)

Fig41

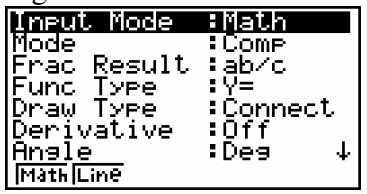



Fig42

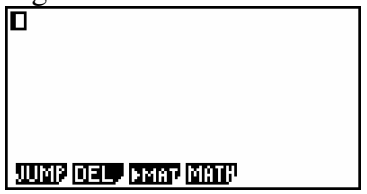



Fig43


Fig44

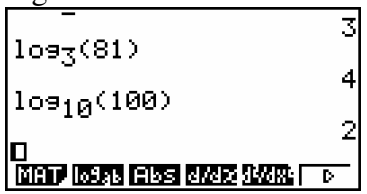



Fig45

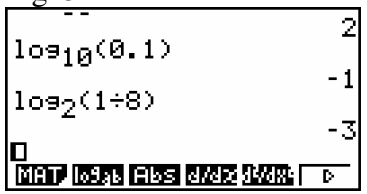
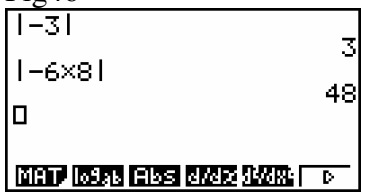



Fig46



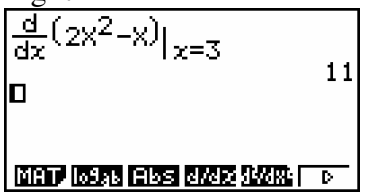
## Derivatives:

To clear the screen: **EXIT F2 F2 F1**

Questions:

1) Find the value of the derivative of $2x^2 - x$ when $x = 3$ **Press MATH dy/dx 2 x ^ 2 - x arrow right 3 EXE** (Fig47)

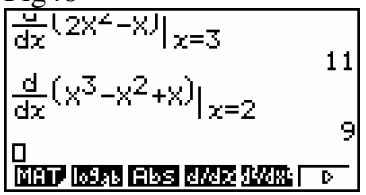
Fig47




2) Find the value of the derivative of $x^3 - x^2 + x$ when $x = 2$

**Press MATH dy/dx x ^ 3 arrow rt - x ^ 2 arrow rt + x arrow rt 2 EXE** (Fig48)

Fig48




## Second Derivatives:

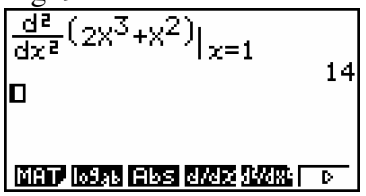
To clear the screen: **EXIT F2 F2 F1**

Questions:

1) Find the value of the second derivative of $2x^3 + x^2$ when $x = 1$

**Press MATH F5 2 x ^ 3 arrow rt + x ^ 2 arrow rt arrow rt 1 EXE** (Fig49)

Fig49




Obviously not all the options have been covered here, but enough to enable you to play and discover more.
Enjoy!!

For further and more advanced information including practice questions refer to the manual 'Mathematics with a Graphics Calculator – Casio fx-9860 AU' by Barry Kissane & Marian Kemp, available at
http://www.casioed.net.au/downloads/books/fx9860/orderBarryBook.pdf

NOTES: