

By Dean Walls - mater technologist

So you've poured over your notes, studied for hours, completed countless review booklets and learned all you can from Math 30 Pure. Now it's time to score well on that diploma exam and earn the mark you've worked so hard for! Here are some shortcuts to save you precious minutes on the big day.

1. TRIGONOMETRY – Changing between degrees and radians

Many of us have different ways of remembering what to do as we change from degrees to radians and back, but did you know your calculator can do it for you?

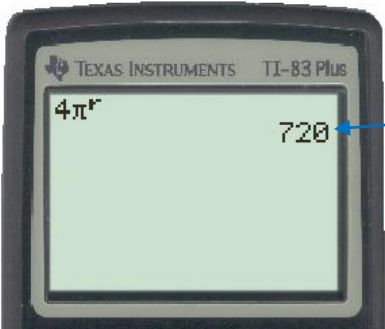
Question: If an angle measures 4π radians, what is its measure in degrees?



Press the MODE button and select the desired type of angle measure (in this case "Degree").



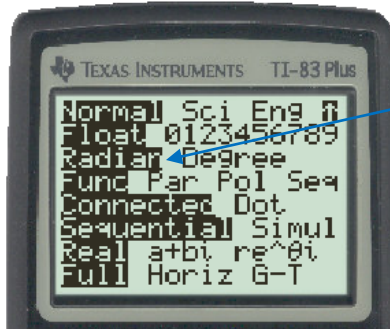
Input " 4π " on the working screen and then press 2nd APPS to select the ANGLE menu.



Select Option 3, which looks like an "r" written as an exponent (it signifies radians). Press ENTER and the calculator will convert the measure for you.

Answer: 4π radians = 720 degrees.

Question: If an angle measures 124 degrees, what is its measure in radians?

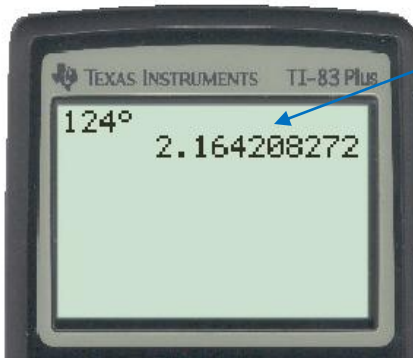


This time press MODE and select “Radian” (our desired type of angle measure).

Input “124” on the working screen and then press 2nd APPS to select the ANGLE menu.



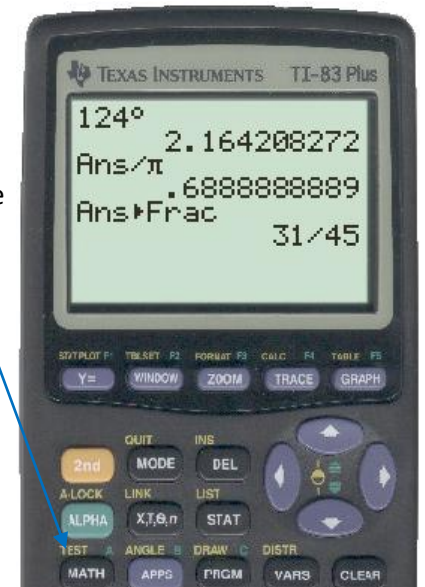
Select Option 1, which is the degrees symbol, and press ENTER. Remember to round appropriately.



Answer: 124 degrees = 2.164 radians.

If the question requires you to write your solution as an exact value, simply divide the answer by π and convert the resulting decimal into a fraction by pressing MATH and selecting Option 1: >Frac. Reintroduce π when writing the final solution.

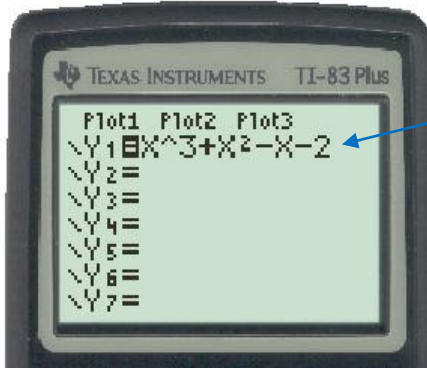
Answer: 124 degrees = $\frac{31}{45}\pi$ radians



2. TRANSFORMATIONS – Graphing the Inverse of a Function ($y = f^{-1}(x)$)

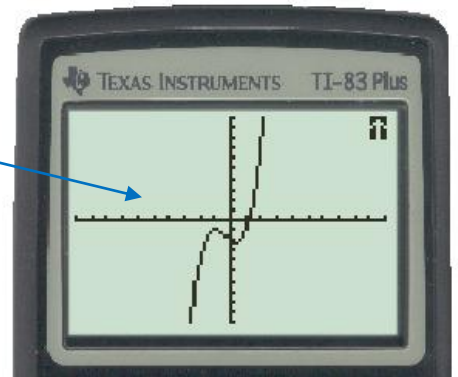
The visual support of a graph is often enough to make a problem much simpler to solve. Graphing by hand, however, can take some time. Here are some ways to help visualize transformations using your graphing calculator.

Question: If $f(x) = x^3 + x^2 - x - 2$, which of the following represents $f^{-1}(x)$?



On the Y= screen, input $Y_1 = x^3 + x^2 - x - 2$

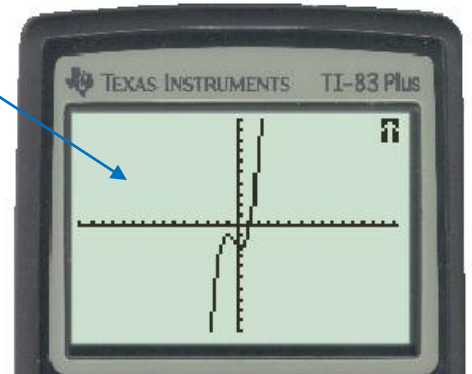
Pressing GRAPH should produce the graph seen to the right.



Before graphing the inverse of this function, we will want to adjust the window dimensions so that vertical and horizontal scales are the same. Press ZOOM and select Option 5: Zsquare.



The graph should show roughly the same shape. (The standard Zoom setting actually stretches the graph in the horizontal direction, much like a widescreen television might stretch a movie not designed for the widescreen).



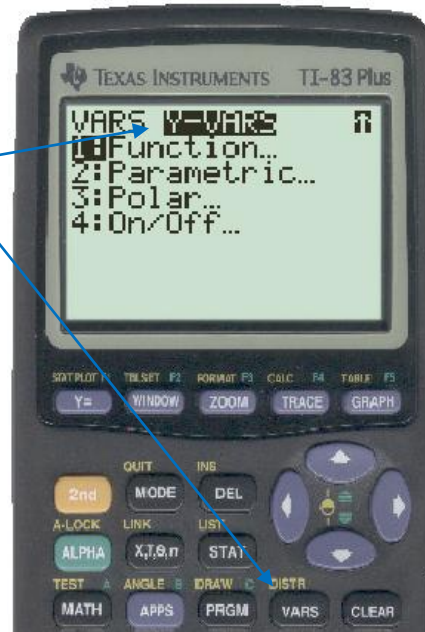
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To see the inverse of this function, press 2nd MODE to select QUIT and return to the working screen. Once there, press 2nd PRGM to select the DRAW menu.

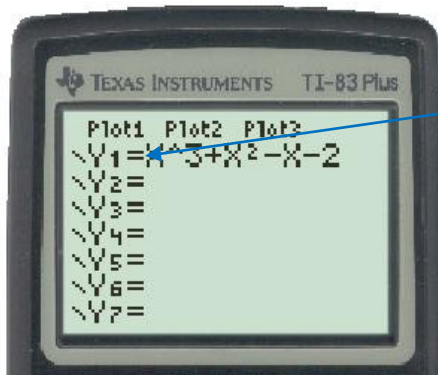
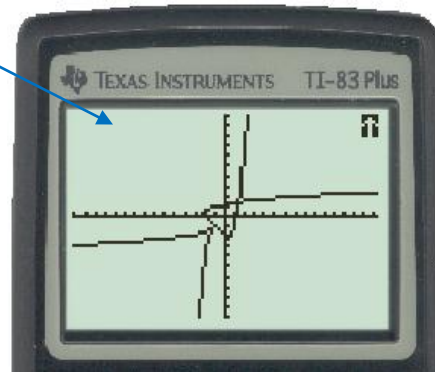
Select Option 8: DrawInv and press ENTER. Once on the working screen, we must specify what we want the inverse of. Press VARS and move the cursor right to select the Y-VARS menu.

Select Option 1: Function and press ENTER. Now select the Y₁ function (because that is where we inputted our original function) and press ENTER. You should end up on the working screen looking as it does in the image to the left.

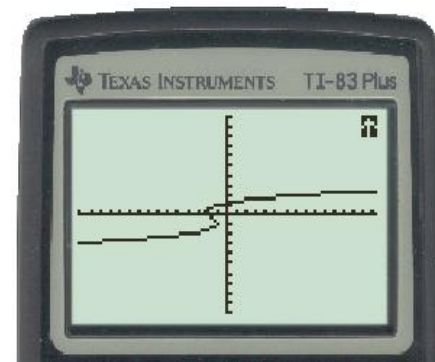


Pressing ENTER again will graph the inverse function overtop of the original function.

If you want to see it without the original graph, return to the Y= screen and deselect the Y₁ function. You will have to enter the Draw command again on the working screen. Do this by pressing 2nd ENTER to repeat the last entered command.



Now choose the appropriate answer from the 4 options given.



Remember that even if the equation is not given for the original function, you should be able to input a similar function (quadratic, cubic, quartic, absolute value, etc.) and that might be enough to determine the correct solution.

A limitation of the DrawInv command is that the transformed image will not appear in the table of values. This means that we are not able to Trace it, nor can we calculate its intersection points with other functions.

3. LOGARITHMS – Solving equations in multiple choice questions

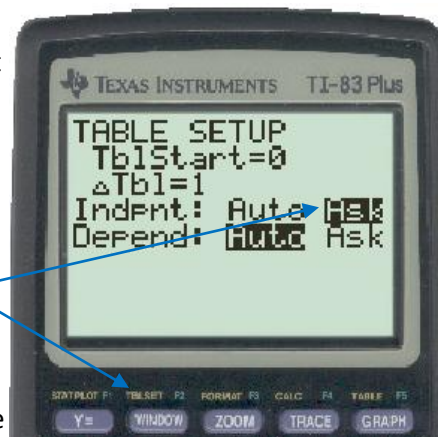
Question: If $\log_x\left(\frac{1}{64}\right) = -\frac{3}{2}$, then x is equal to: A. 16 B. 8 C. $\frac{1}{8}$ D. $\frac{1}{16}$

When asked as a multiple choice question, this problem only requires us to verify which of the four given values is true. Be sure to remember the Change of Base rule when inputting logarithmic functions into your calculator.

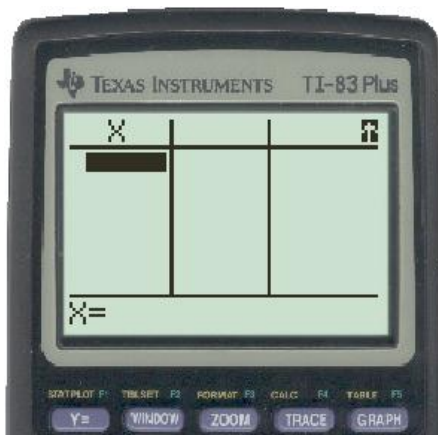


On the Y= screen, we input the left side of the equation as Y_1 . We could input the right side of the equation as Y_2 and calculate the points of intersection, but that might require us to adjust the Window dimension. Instead, let's use the Table of Values.

Press 2^{nd} and then the WINDOW key to select the TBLSET menu. This allows us to change aspects of our Table of Values. Here we will move the Independent Variable (which is x) option to "Ask". This will allow us to select the values we want evaluate on the table of values.

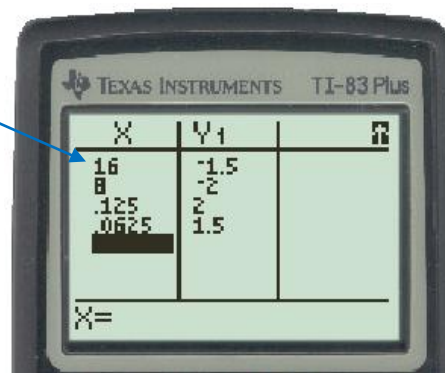


Press 2^{nd} and then the GRAPH key to select the TABLE screen. Here you should find three empty columns. Input the four multiple choice answers as x -values and press ENTER after each.



Whichever option produces the same value as the right side of the equation will be our correct answer.

Answer: A. 16

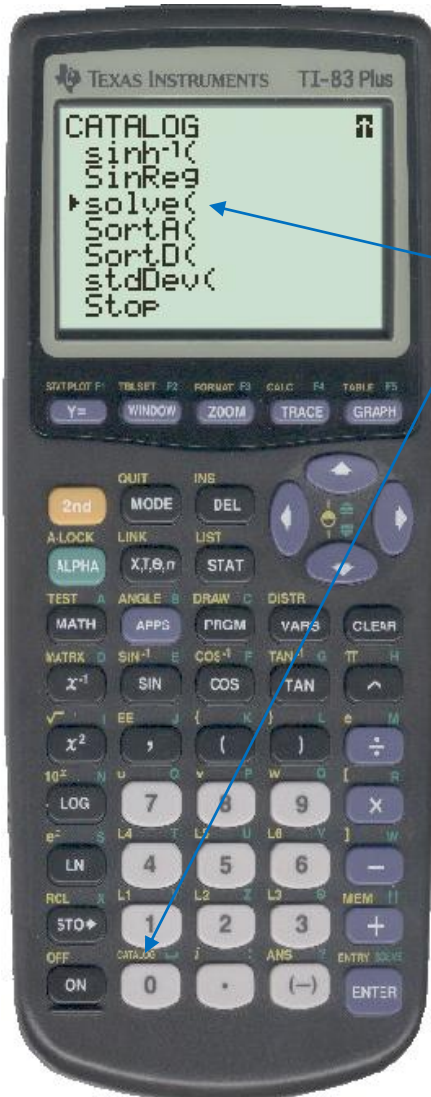


This same approach could be used to solve a trigonometric equation, though it is more likely that a question of this type will be concerning logarithms.

4. LOGARITHMS – Solving equations in numeric response questions

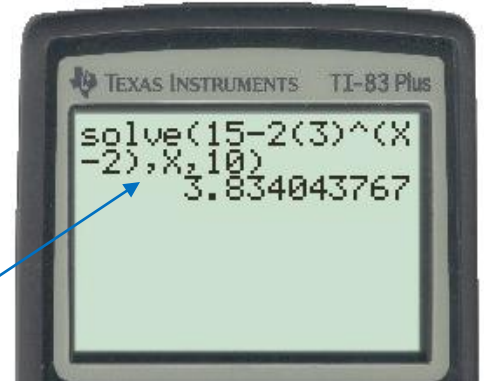
The previous example is wonderful for multiple choice questions, but what do we do when we asked to find the numerical value of x on our own? Let's make the calculator do it!

Question: The solution, correct to the nearest hundredth, of the equation $15 = 2(3)^{x-2}$ is _____ .



From the working screen, press 2nd and then the 0 key to select the CATALOG menu. You'll want to choose "solve(", so press the 4 key (it corresponds to T) and scroll up to it. Press ENTER.

Using "solve(", we will be required to enter three parameters: an expression, a variable, and an estimated answer. To determine the expression, simply manipulate the equation so that one side is equal to zero. In this case, we will use $15 - 2(3)^{x-2}$. The variable will be x . Finally, we enter an estimated answer (in the example to the right we have estimated 10). The accuracy of our guess is irrelevant – the calculator will find the correct value. Be sure to separate each parameter by a comma, as seen to the right.



Notice that even if the estimate were changed to 100, the correct answer would still be found.

Answer: 3.83

Hopefully these calculator strategies will help you in your diploma. Remember to be very diligent when entering expressions and commands. A simple input error can have a significant effect on your solution!

