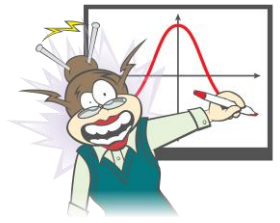


Mathematical Methods with TI-Nspire™ CX CAS
Techniques for effective TI-Nspire™ use in Mathematical Methods
Webinar questions and student revision questions



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Each of the questions included here can be solved using the TI-Nspire CX CAS.

Recommended Document Settings (and adjustments for particular problems)

Question 1 Calculation Mode: Auto v. Exact

Perform the following calculations using 'Auto' calculation mode.
Repeat the calculations using 'Exact' calculation mode. Explain the different outputs for the two calculation modes.

- Solve the equation $\log_e(x) = 4 - x^2$, for x .
- Evaluate $\int_{-3}^1 e^{-x^2} dx$, correct to: (i) three decimal places; (ii) four decimal places
- If $f(x) = 0.125 \sin(2x)$, evaluate $f\left(\frac{\pi}{6}\right)$.

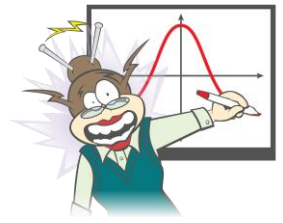
Response:

Question 2 Defining functions and working with variables

In a new problem, define/assign/store the following using a different method in each case.

- $f(x) = x^2 - 2x - 3$
- $g(x) = 3 - x$
- $p(x) = \frac{1}{\sqrt{2\pi}} e^{-\left(\frac{1}{2}x^2\right)}$
- $h(x) = 4 \cos\left(\frac{x}{2}\right)$
- The values: $\frac{\pi}{3}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{5\pi}{3}$ in a list labelled 'a'. Hence evaluate valuate $h(x)$ for x equal to each of the values in list 'a'. Finally, delete 'a' (using the 'delete variable' command).

Response:



Question 3 Deleting variables

- Evaluate $h(x)$ for x equal to each of the values in list 'a'.
- Delete the variable 'a' (using the 'delete variable' command).
- Check whether variable 'a' appears when the <var> key is pressed.

Response:

Question 4 Maths Actions and context menu

Add a Calculator page to the current document.

Input $f(x)$, but do not press <enter>.

Open the context (pop-up) menu: (press <ctrl>+<menu>)

- Explore the context menu items 'Maths Actions' and 'Recall definition and Graph'
- Explore 'Maths Actions' for the expression $2x^3 + x^2 - 20x + 10$ and the equation $2x^3 + x^2 - 20x + 10 = 0$.
- Use 'Maths Actions' to help find the coordinates of the turning points of the graph of $y = 2x^3 + x^2 - 20x + 10$.

Response:

Question 5 Graphs application tips Pt. 1

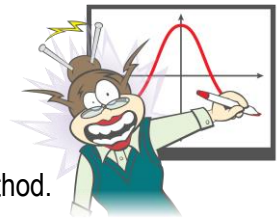
The functions f, g and h are defined above.

- Graph the functions f and g on the same set of axes.
- Add a lined grid to the graph.
- Find the coordinates of the points of intersection of the graphs, using two different methods.
- Use the 'Analyse Graph' menu to find the coordinates of key points of the graph of f .

Response:

Question 6 Graphs application tips Pt. 1 (continued)

- On the same set of axes, show the graphs of $y = h(x)$ and $y = \frac{d(h(x))}{dx}$ over the domain $[-3\pi, 2\pi]$.



- b. Add a lined grid to the graphs, with intervals of $\frac{\pi}{2}$ along the x-axis.
- c. Find the coordinates of the points of intersection of the two graphs, using a graphical method.

Response:

Question 7 Graphs application tips Pt. 2

The functions p and h are defined above.

- a. Graph the function p and adjust the axes appropriately.
- b. Use a graphical method to find the area of the region enclosed by the graph of p , the x-axis and the lines $x = -2$ and $x = 1$.
- c. Use a graphical method to find the area of the region bounded by the graphs of f and g .

Response:

Question 8 Graphs with one or more parameters

Consider the family of functions of the form $f(x) = (x - h)^2 + k$ with domain $x \geq h - 3$.

- a. Add a new problem to the document and obtain the graph of f , including sliders to control the values of h and k .
- b. Explore the effect of changing the values of h and k .

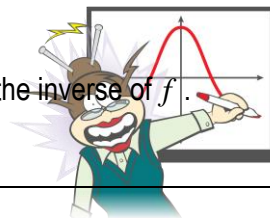
Response:

Question 9 Relations graphing

- a. Graph the line $x = h - 3$ using the Relation Graph Entry.
- b. Obtain the coordinates of the point P , where the graph of f intersects $x = h - 3$. Hence hide the line $x = h - 3$.
- c. Explore the effect of changing the values of h and k on the coordinates of P .

Response:

- d. Graph the line $y = x$ using Relation Graph Entry. Change the line Attributes to 'dotted' line.
- e. Graph the inverse of f using $x = f(y)$ in Relation Graph Entry.



f. Set the value of $k = -4$. Observe the effect of changing the value of h on the graph of the inverse of f .

Response:

Question 10 Saving documents and renaming problems

- Save the document as 'Webinar 1'.
- Add a new problem to the document. Select a Graphs page.
- Obtain a thumbnail view of the problems in the document. Rename the previous problem 'Relations graphs'

Response:

Question 11 Graph Trace

Consider the function $f(x) = \frac{1}{2}(x^3 - 2x^2 - 3x), x \geq -2$.

Use Graph Trace to find the y-coordinates of points $A\left(-\frac{3}{2}, y_1\right)$ and $B\left(\frac{7}{2}, y_2\right)$.

Response:

Question 12 Geometry menu in Graphs

For the graph in Question 11 above, use the Geometry menu to explore the following.

- Measure the distance AB , correct to 4 decimal places.
- Add a tangent to the to the graph at $x = 2$. Measure the gradient of the tangent.
- The tangent to the graph at $x = -\frac{1}{2}$ and $x = \frac{3}{2}$.
- Copy the previous problem. Edit the function graph to the form $f(x) = k(x-a)(x-b)(x-c)$.
- Hence explore whether the property observed in Question 12d for the particular example applies to graphs of all functions of the form $f(x) = k(x-a)(x-b)(x-c)$, where a, b, c, k parameters.

Response:
