

Chapter 11 / **Example 18**

Volume of rotation of an area between two curves

- a** Sketch $f(x) = \cos x$ and $g(x) = e^{-x}$ on the same axes for $0 \leq x \leq 1.5$.
b Find the intersection points of the two curves in the given interval.
c Find the volume of revolution formed when the region enclosed by the curves f and g is rotated through 2π radians about the x -axis.

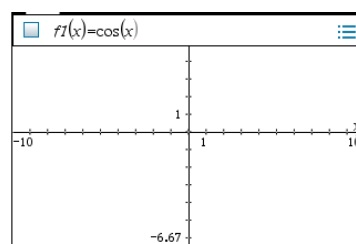
Open a new document and add a Graphs page.

The entry line is displayed at the top of the work area.

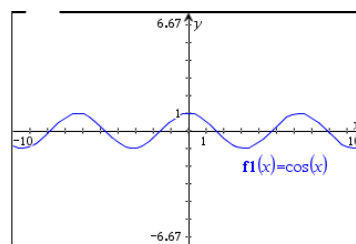
The default graph type is function, so ' $f1(x)=$ ' is displayed.

The default axes are $-10 \leq x \leq 10$ and $-6.67 \leq y \leq 6.67$.

Type $\cos x$ and press **enter**.



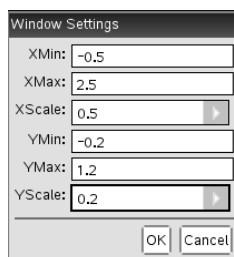
The GDC displays the graph $f1(x) = \cos x$ with the default axes.



Press **menu** 4:Window/Zoom | 1:Window Settings...

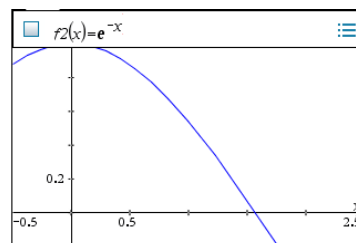
Set the axes to show $-0.5 \leq x \leq 2.5$ with a scale of 0.5 and $-0.2 \leq y \leq 1.2$ with a scale of 0.2.

Press **enter** when you have finished.

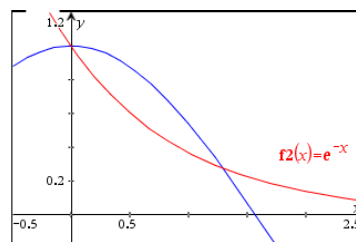


Press **tab** to display the entry line again. This time ' $f2(x)=$ ' is displayed.

Type e^{-x} and press **enter**.



The GDC now displays the curves $f1(x) = \cos x$ and $f2(x) = e^{-x}$.



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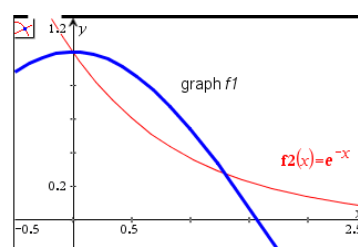
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There are two ways to find intersection points. The first is to use **menu** 6:Analyse Graph | 4:Intersection. When there is more than one point, however, the following method is quicker.

Press **menu** 8:Geometry | 1:Points & Lines | 3: Intersection Point(s)

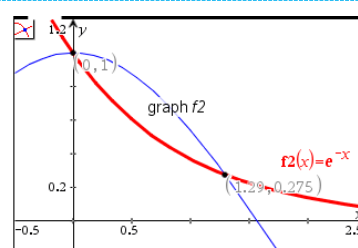
To find the points use the touchpad to highlight the cosine curve. You will see 'graph f1' displayed.

Click the touchpad.



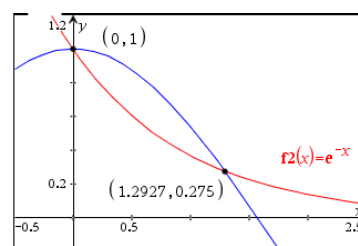
Use the touchpad to highlight the straight line. You will see 'graph f2' displayed.

Click the touchpad.



The GDC now displays the coordinates of both points of intersection.

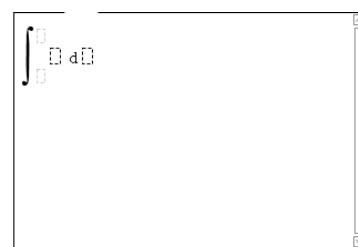
The points of intersection are 0,1 and 1.293,0.275



Press **ctrl** **doc** (⌘+page) and add a new Calculator page.

Press **int** and select **∫** with the trackpad.

The template shows places for the limits, the function and the variable that you are integrating with respect to.



Enter the lower limit 0 and the upper limit 1.293.

Type $\pi \cos^2 x$ and type x.

Type -

Press **int** and select **∫**

Enter the lower limit 0 and the upper limit 1.293

Type πe^{-x^2} , type X and press **enter**.

The volume is 0.993.

