

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.

Press **MENU** 5 **GRAPH** to display the equation entry screen.

Type $\cos x$ and press **EXE** to enter the first equation as Y1.

Type e^{-x} and press **EXE** to enter the second equation as Y2.

Graph Func : Y=
Y1: $\cos x$ [—]
Y2: e^{-x} [—]
Y3: [—]
Y4: [—]
Y5: [—]
Y6: [—]
[SELECT] [DELETE] [TYPE] [TOOL] [MODIFY] [DRAW]

Press **SHIFT** **F3** V-WIN.

Set the axes to show $0 \leq x \leq 2.5$ with a scale of 0.5 and
 $0 \leq y \leq 1.2$ with a scale of 0.2.

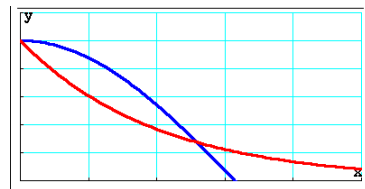
You can leave the other items as they are.

Press **EXIT** when you have finished.

View Window
Xmin : 0
max : 2.5
scale : 0.5
dot : 6.6137×10^{-3}
Ymin : 0
max : 1.2
[INITIAL] [TRIG] [STANDARD] [V-MEM] [SQUARE]

Press **F6** DRAW to display the graph screen

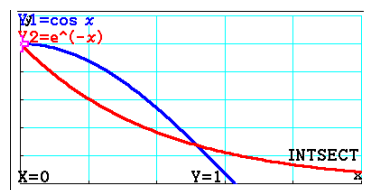
The GDC now displays the curves $Y1 = \cos x$ and $Y2 = e^{-x}$.



To find the points of intersection press **F5** G-Solv **F5** Intersect.

The first intersection is at $0, 1$.

Press **EXE** to display the coordinates.

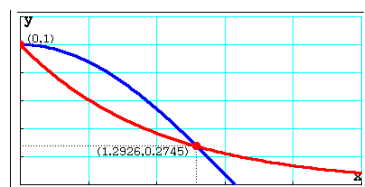


Press **EXE** to move to the second intersection.

Press **EXE** to display the coordinates.

Press **EXIT** to leave G-Solv mode and **F6** DRAW to display the graph screen again.

The GDC displays intersections at $0, 1$ and $1.293, 0.275$



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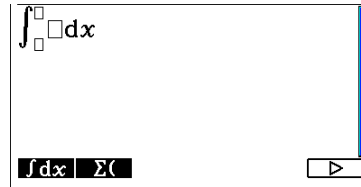
Volume of rotation of an area between two curves

$$V = \int_0^{1.293} \pi \cos x^2 dx - \int_0^{1.293} \pi e^{-x^2} dx$$

Press **MENU** 1 **RUN-MAT** to display the Run-Matrix screen for arithmetical calculations.

Press **F4** MATH **F6** \triangleright **F1** $\int dx$

You will see an integral template. There are three fields to complete in the template: one for each of the limits and one for the function you are integrating.



Type $\pi \cos x^2$

Enter the lower limit 0 and the upper limit 1.293.

Type $-$

Press **F1** $\int dx$

Type πe^{-x^2}

Enter the lower limit 0 and the upper limit 1.293 and press **EXE**.

The volume is 0.993.

