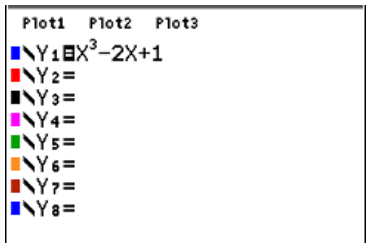
Chapter 8 / **Example 2**

Finding the area between graphs

Find the total area enclosed by the graph $f(x) = x^3 - 2x + 1$ and its reflection in the x-axis.

Press [f1] [y=] to display the equation entry screen.

Type $x^3 - 2x + 1$ and press [enter] to enter the equation as Y_1.



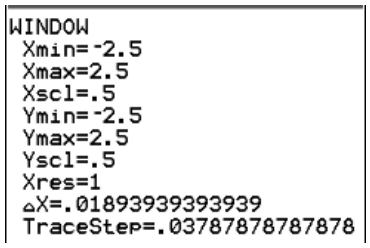
Choose suitable window settings to display the graph.

Press [f2] [window] [format]

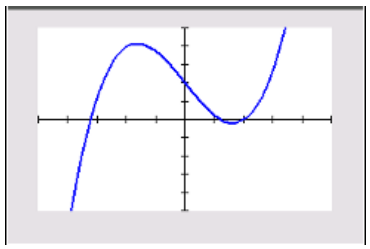
Set the axes to show $-2.5 \le x \le 2.5$ and $-2.5 \le y \le 2.5$ with scales of 0.5.

You can leave the other items as they are.

Press [f5] [graph] when you have finished.



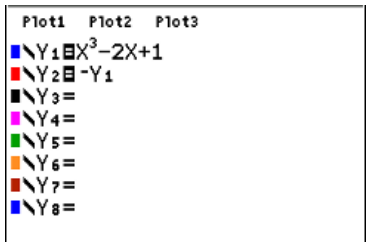
The GDC displays the curve $Y_1 = x^3 - 2x + 1$ in a suitable window.



The reflection of the curve Y_1 in the x-axis is $-Y_1$.

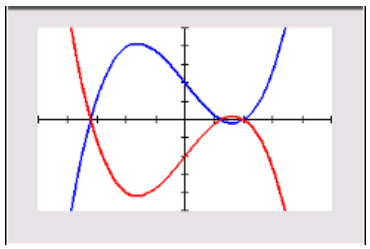
Press [f1] [y=] to display the equation entry screen.

Type −, then press [VARS] [f4] 1:Y_1 and press [enter].



Press [f5] [graph] when you have finished.

The GDC displays the curve $Y_1 = x^3 - 2x + 1$ and its reflection in the x-axis.



Chapter 8 / **Example 2**

Finding the area between graphs

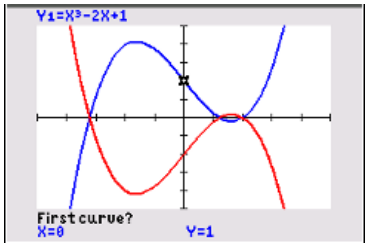
Find the intersection points and then the areas under each of the curves between these limits. To find the area bounded by the two curves you will need to subtract the areas.

Press [2nd] [f4] [calc] 5:intersect.

To find the intersection you need to choose the two lines that intersect.

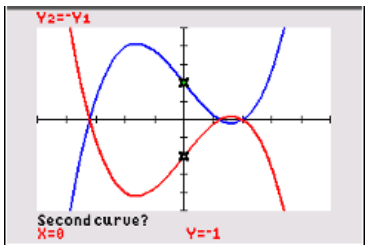
The GDC shows a cross on one of the lines and 'First curve?'.

Press [enter].



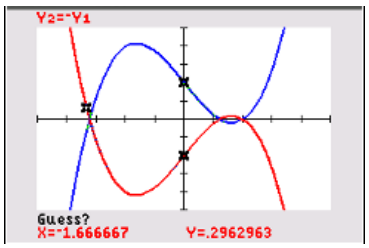
The GDC shows a cross on the other line and 'Second curve?'.

Press [enter].



The GDC requires an initial guess for the position of the intersection. Choose a point near the left-hand intersection by pressing [◀] [▶].

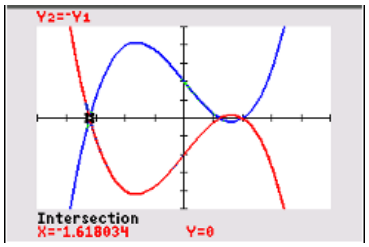
Press [enter].



The GDC displays the intersection of the two straight lines at the point $(-1.62, 0)$.

To store an accurate value of the area press [2nd] [quit] to enter the home screen.

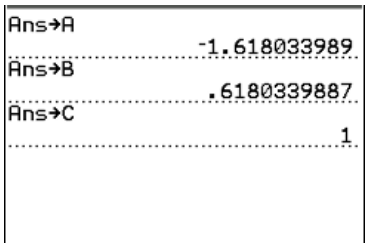
Press [sto→] [XTΘn] A and press [enter].



Repeat to find the other two intersection points, storing these as B and C.

The other intersection points are $(0.618, 0)$ and $(1, 0)$.

Press [f5] [graph] to return to the graph screen.



Chapter 8 / **Example 2**

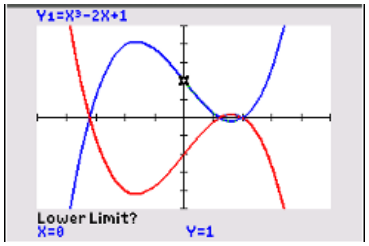
Finding the area between graphs

Press [2nd] [calc] 7:∫f(x)dx.

Make sure that Y_1 is selected.

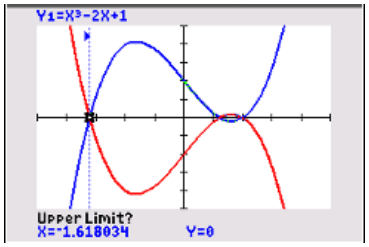
To find the area you need to give the lower and upper limits of the region that includes the intersection.

The GDC asks you to set the lower limit.



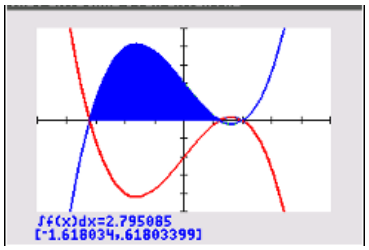
Type [ALPHA] A and press [enter].

The GDC asks you to set the upper limit.



Type [ALPHA] B and press [enter]. (The value of the *x*-coordinate is stored in the GDC as B).

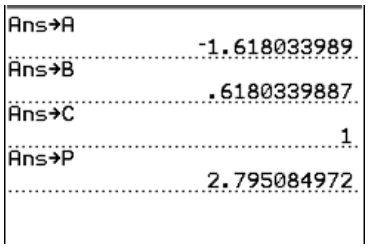
The area under the curve Y_1 is 2.80.



To store an accurate value of the area press [2nd] [quit] to enter the home screen.

Press [sto→] [ALPHA] P and press [enter].

Press [f5] [graph] to return to the graph screen.

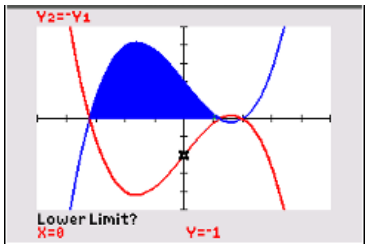


Press [2nd] [calc] 7:∫f(x)dx.

Make sure that Y_2 is selected.

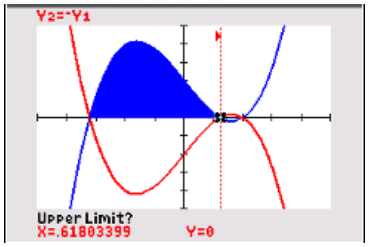
To find the area you need to give the lower and upper limits of the region that includes the intersection.

The GDC asks you to set the lower limit.



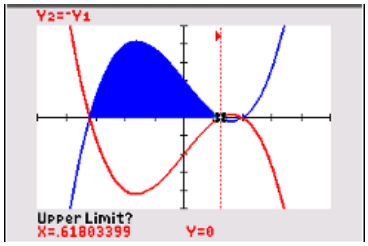
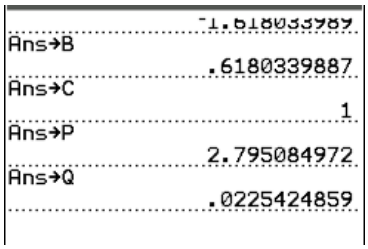
Type [ALPHA] B and press [enter].

The GDC asks you to set the upper limit.



Chapter 8 / **Example 2**

Finding the area between graphs

Type [ALPHA] C and press [enter]. The area under the line Y_2 is 0.0225.	
To store an accurate value of the area press [2nd] [quit] to enter the home screen. Press [sto→] [ALPHA] Q and press [enter].	
The required area can be found using symmetry. Area $= 2(P+Q)$. Type 2 ([ALPHA] P [+] [ALPHA] Q). The GDC has calculated the enclosed area which is 5.64.