

Chapter 7 / **Example 8**

Finding areas with integration

This example is to be done *without* using a GDC. Here you learn to find the definite integrals by using one.

- Factorize the expression $2 - x - 2x^2 + x^3$.
- Hence sketch the graph $f(x) = 2 - x - 2x^2 + x^3$.
- Find the area of the region bounded by the graph $f(x) = 2 - x - 2x^2 + x^3$ and the x -axis.

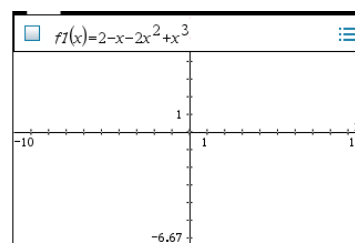
Open a new document and add a Graphs page.

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

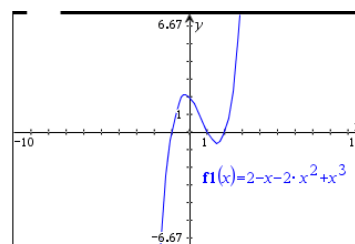
The default graph type is function, so 'f1(x)= ' is displayed.

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

Type $2 - x - 2x^2 + x^3$ and press **enter**.



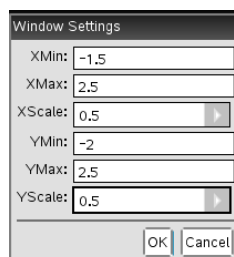
The GDC displays the graph $f1(x) = 2 - x - 2x^2 + x^3$ with the default axes.



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

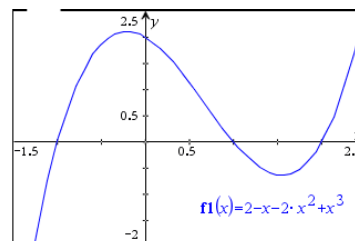
Set the axes to show $-1.5 \leq x \leq 2.5$ and $-2 \leq y \leq 2.5$ with scales of 0.5.

Press **enter** when you have finished.



The GDC displays the graph in a suitable window.

Clearly, the zeros are at $(-1, 0)$, $(1, 0)$ and $(2, 0)$.



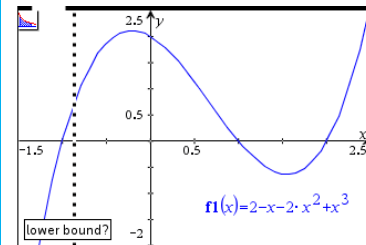
Chapter 7 / **Example 8****Finding areas with integration**

Integrate the section of the curve between $x = -1$ and $x = 1$ to find the area bounded by the curve and the x -axis.

To find the integral press **menu** 6:Analyze Graph | 6:Integral.

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

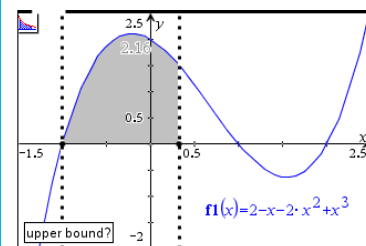
The GDC shows a line and asks you to set the lower bound.



Do not use the line to set the lower bound as you need to enter an exact value.

Type -1 and press **enter**.

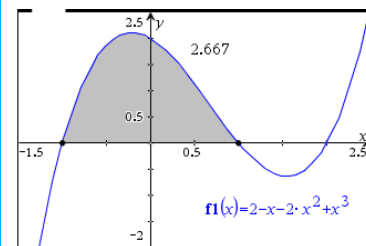
The GDC shows a line and asks you to set the upper bound.



Type 1, the upper bound, and press **enter**.

The GDC shows the area defined by the integral and its value.

$$\int_{-1}^1 (2 - x - 2x^2 + x^3) dx = 2.667.$$

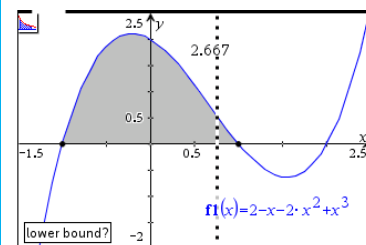


Integrate the section of the curve between $x = 1$ and $x = 2$ to find the area bounded by the curve and the x -axis.

To find the integral press **menu** 6:Analyze Graph | 6:Integral.

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

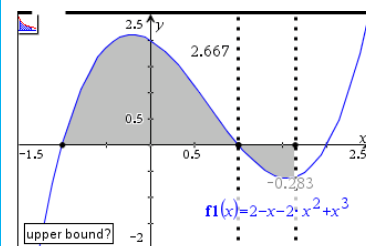
The GDC shows a line and asks you to set the lower bound.



Do not use the line to set the lower bound as you need to enter an exact value.

Type 1 and press **enter**.

The GDC shows a line and asks you to set the upper bound.



Chapter 7 / **Example 8**

Finding areas with integration

Type 2, the upper bound, and press **enter**.

The GDC shows the area defined by the integral and its value.

$$\int_1^2 (2 - x - 2x^2 + x^3) dx = -0.417.$$

Adding the absolute values of the two areas:

$$2.667 + 0.417 = 3.08.$$

