

## Chapter 7 / Example 8

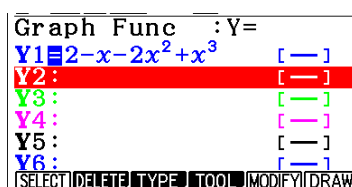
## Finding areas with integration

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.

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

Type  $2 - x - 2x^2 + x^3$  and press **EXE** to enter the equation as Y1.



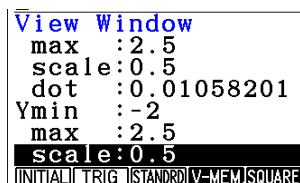
Choose suitable window settings to display the graphs.

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

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

You can leave the other items as they are.

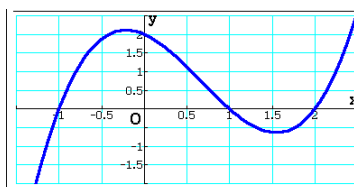
Press **EXIT** when you have finished.



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

The GDC displays the curve  $Y1 = 2 - x - 2x^2 + x^3$  in a suitable window.

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

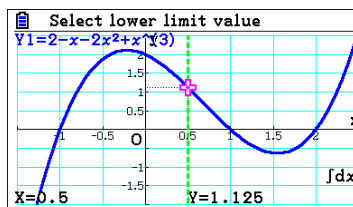


Integrate the section of the curve between  $x = -1$  and  $x = 1$  to find the area bounded by the curve and the  $x$ -axis.

To find the integral press **F5** G-SOLVE **F6**  $\triangleright$  **F3**  $\int dx$  **F1**  $\int dx$ .

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

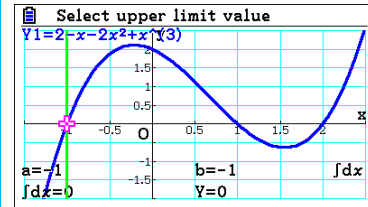
The GDC asks you to set the lower limit.



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Type  $-1$  and press **EXE**.

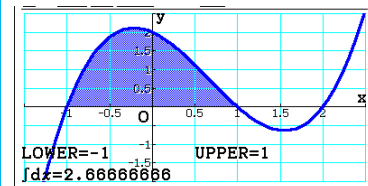
The GDC asks you to set the upper limit.



Type 1, the upper limit, and press **EXE**.

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

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

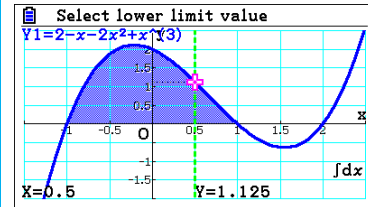


Integrate the section of the curve between  $x=1$  and  $x=2$  to find the area bounded by the curve and the  $x$ -axis.

To find the integral press **F5** G-SOLVE **F6**  $\triangleright$  **F3**  $\int dx$  **F1**  $\int dx$ .

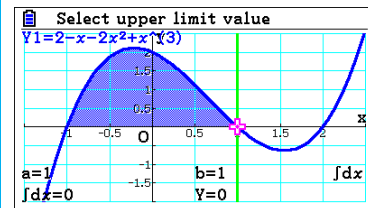
To find the area you need to give the lower and upper limits of the region that includes the intersection.

The GDC asks you to set the lower limit.



Type 1 and press **EXE**.

The GDC asks you to set the upper limit.



Type 2, the upper limit, and press **EXE**.

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:

$$2.667 + 0.417 = 3.08.$$

