

## Chapter 13 / Example 5

# Modelling Change

Using functions can be an efficient way to make calculations with the GDC.

A company uses the function  $C(x) = 100 + x - 0.01x^2 + 0.00006x^3$  to estimate the cost, in Euros, of producing  $x$  items. The revenue, in Euros, of selling  $x$  items is modelled by  $R(x) = 22.8x - 0.001x^2$ .

- Find the cost of producing 300 items.
- Find the marginal cost of producing 300 items and explain what this means, in context.
- Find the marginal profit of selling 300 items and explain what this means, in context.

You are first going to define the functions  $C(x)$ ,  $R(x)$  and a profit function  $P(x)$  using the built-in functions Y1, Y2 and Y3.

Press **MENU** 5 **GRAPH** **2/F4** to display the equation entry screen.

Type  $100 + x - 0.01x^2 + 0.00006x^3$  and press **EXE** to enter  $C(x)$  as Y1.

Type  $22.8x - 0.001x^2$  and press **EXE** to enter  $R(x)$  as Y2

To enter  $^3$ , press **^** **3**.

To enter  $P(x) = R(x) - C(x)$  in Y3

Press **VAR** **F4** **GRAPH** **F1** Y and type 2

Type **=**

Press **F1** Y and type 1

Press **α** **2**

Press **MENU** 1 **RUN-MAT** **2/F4** to display the Run-Matrix screen for arithmetical calculations.

Find  $C(300)$

Press **VAR** **F4** **GRAPH** **F1** Y and type 1

Type ( 300 ) and press **EXE**

The cost of producing 300 items is €1,120

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The marginal cost function is the derivative of the cost function. Use a GDC to find  $C'(300)$ .

Press **EXIT** twice then press **F4** MATH **F4** d/dx

The template has spaces for the function and the value that it is evaluated at.

Enter the function Y1 by pressing **VAR** **F4** GRAPH **F1** Y and typing 1

Type 300 and press **EXE**.

The screen displays the derivative template  $\frac{d}{dx}(\square)|_{x=\square}$ . The function Y1(300) is entered in the top left, and the value 1120 is shown in the top right. The bottom of the screen shows the function list with Y1 selected.

The marginal cost of producing 300 items,  $C'(300)$ , is €11.20

The screen displays the derivative template  $\frac{d}{dx}(Y1)|_{x=300}$ . The function Y1(300) is entered in the top left, and the value 1120 is shown in the top right. The bottom of the screen shows the function list with Y1 selected.

The marginal profit function is the derivative of the profit function. Use a GDC to find  $P'(300)$ .

Press **EXIT** twice then press **F4** MATH **F4** d/dx

Enter the function Y3 by pressing **VAR** **F4** GRAPH **F1** Y and typing 3

Type 300 and press **EXE**.

The marginal cost of selling 300 items,  $P'(300)$ , is €11.

The screen displays the derivative template  $\frac{d}{dx}(Y3)|_{x=300}$ . The function Y3(300) is entered in the top left, and the value 11 is shown in the top right. The bottom of the screen shows the function list with Y3 selected.