Exercise 3

Paper 2 style · Graphic display calculator

3 6 marks SL 5.8 ●●○ Typical

A bakery makes n special cakes a day. Its daily profit, in euros, is modelled by $P(n) = 120n\,\mathrm{e}^{-0.04n} - 500$, for $0 \leq n \leq 100$.

(a) Find the number of cakes that gives the greatest profit. **[2]**

(b) Find the greatest daily profit. **[2]**

(c) Find the numbers of cakes for which the bakery makes a profit. **[2]**

The markscheme is on the next page: try the question first. Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software. Not affiliated with or endorsed by the International Baccalaureate Organization.
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MARKSCHEME (a)

use of GDC (maximum of the graph), or $P'(n) = 120\,\mathrm{e}^{-0.04n}(1 - 0.04n) = 0$ **(M1)**

$n = 25$ **A1**

Total 2 marks

Note When the GDC gives a decimal, the two whole numbers either side are compared.

MARKSCHEME (b)

$P(25) = 3000\,\mathrm{e}^{-1} - 500$ **(M1)**

604 euros $(603.638\ldots)$ **A1**

Total 2 marks

MARKSCHEME (c)

$P(n) > 0$: $5.11 < n < 70.8$ **(M1)**

$6 \leq n \leq 70$ **A1**

Total 2 marks

Note The number of cakes is a whole number: $n = 5$ gives a loss and $n = 71$ a loss.