A-Level Starter Activity

Jahwa Maths

Topic: Exponential Modelling

Chapter Reference: Pure 1, Chapter 14

5 minutes

1. A quantity N is decreasing such that at time t,

$$N = N_0 e^{kt}$$

Given that at time t = 10, N = 300 and that at time t = 20, N = 225, fin,

a. The values of the constants N0 and k (4)

b. The value of t when N = 150 (3)

Solutions

1a.

$300 = N_0\, e^{10k}$ $N_0 = \frac{300}{e^{10k}}$	**M1**
$225 = \frac{300}{e^{10k}} \times e^{20k}$	**M1**
$e^{10k} = \frac{3}{4}$ $k = \frac{1}{10} \ln \frac{3}{4} = -0.0288$	**M1**
$N_0 = \frac{300}{0.75} = 400$	**M1**

1b.

$N = 400e^{-0.02877t}$	**M1**
$150 = 400e^{-0.02877t}$	**M1**
$t = \frac{-1}{0.02877} \ln \frac{3}{8} = 34.1$ (3 s.f)	**M1**