C3 EXPONENTIALS AND LOGARITHMS *Worksheet B*

1 $f(x) = 4^{0.1x}$.

a Calculate the value of

i f(0) **ii** f(5) **iii** f(10) **iv** f(15)

b Hence, write down the value of f(20), giving a reason for your answer.

c Given that f(12) is approximately 5.278, write down an approximate value for f(17).

2 A quantity N is increasing exponentially.

Given that at time $t = 0$, $N = 15$ and that at time $t = 18$, $N = 30$, find

a the value of N when $t = 36$,

b the value of t when $N = 480$.

3 A quantity P is decreasing exponentially.

Given that at time $t = 16$, $P = 54$ and that at time $t = 20$, $P = 18$, find

a the value of t when $P = 2$,

b the value of P when $t = 0$.

4 A quantity N is decreasing such that at time t

$$N = 50e^{-0.2t}.$$

a Find the value of N when $t = 10$.

b Find the value of t when $N = 3$.

5 A radioactive substance is decaying such that its mass, m grams, at a time t years after initial observation is given by

$$m = 240e^{kt}.$$

Given that when $t = 180$, $m = 160$, find

a the value of the constant k,

b the time it takes for the mass of the substance to be halved.

6 A radioactive substance is decaying exponentially. Its mass, m grams, at a time t years after initial observation is given by

$$m = m_0e^{kt},$$

where m_0 and k are constants. Given that the mass of the substance is halved after 410 years,

a find the value of k.

Given also that $m = 388$ when $t = 150$,

b find the value of m_0.

7 A quantity N is decreasing exponentially.

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

a N_0, the value of N when $t = 0$,

b the value of k such that

$$N = N_0e^{kt},$$

c the value of t when $N = 150$.