

16. (a) Express  $\frac{1}{P(11 - 2P)}$  in partial fractions. (3)

A population of meerkats is being studied.

The population is modelled by the differential equation

$$\frac{dP}{dt} = \frac{1}{22}P(11 - 2P), \quad t \geq 0, \quad 0 < P < 5.5$$

where  $P$ , in thousands, is the population of meerkats and  $t$  is the time measured in years since the study began.

Given that there were 1000 meerkats in the population when the study began,

(b) determine the time taken, in years, for this population of meerkats to double, (6)

(c) show that

$$P = \frac{A}{B + Ce^{-\frac{1}{2}t}}$$

where  $A$ ,  $B$  and  $C$  are integers to be found.

(3)