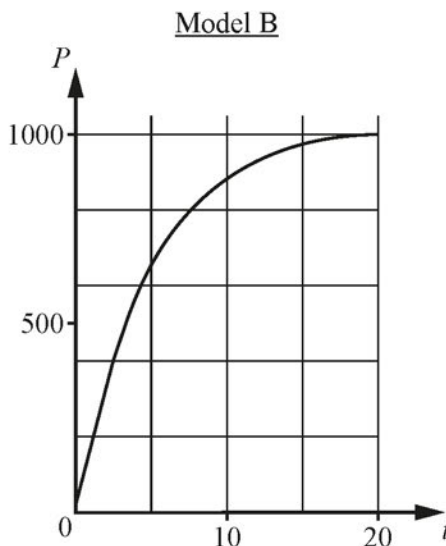
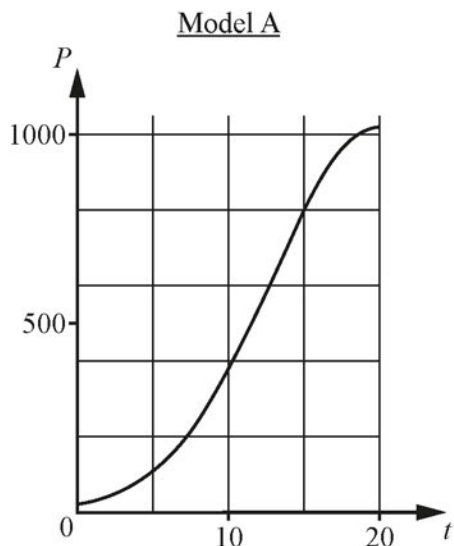


- 4 A species of animal is to be introduced onto a remote island. Their food will consist only of various plants that grow on the island. A zoologist proposes two possible models for estimating the population  $P$  after  $t$  years. The diagrams show these models as they apply to the first 20 years.



- (a) Without calculation, describe briefly how the rate of growth of  $P$  will vary for the first 20 years, according to each of these two models. [1]

The equation of the curve for model A is  $P = 20 + 1000e^{-\frac{(t-20)^2}{100}}$ .

The equation of the curve for model B is  $P = 20 + 1000\left(1 - e^{-\frac{t}{5}}\right)$ .

- (b) Describe the behaviour of  $P$  that is predicted for  $t > 20$

(i) using model A, [1]

(ii) using model B. [1]

There is only a limited amount of food available on the island, and the zoologist assumes that the size of the population depends on the amount of food available and on no other external factors.

- (c) State what is suggested about the long-term food supply by

(i) model A, [1]

(ii) model B. [1]