15) $P(t)$: population of mosquitoes at t.

t : (time measured in weeks)

$r = 2$ growth rate

Model :

$$\left.\begin{aligned} \frac{dP}{dt} &= 2P - 140\,000 \\ P(0) &= 200,000 \end{aligned}\right\} \text{I.V.P.}$$

$$\ln(2P - 140,000) = 2t + C$$

$$2P - 140,000 = Ce^{2t}$$

$$P = Ce^{2t} + 70,000$$

$$200,000 = P(0) = C + 70,000 \rightarrow \boxed{C = 130,000}$$

$$\therefore \boxed{P(t) = 130,000\,e^{2t} + 70,000}$$

Remark: The answer in the textbook is

$$P(t) = 201,977.31 - 1,977.31\,e^{\ln 2\, t}$$

$$0 \leq t \leq t_f \cong 6.6745 \text{ (weeks)}$$

which is obtained using a different model in a different setting.