Solution 7.5

8.

a) Let $P(t)=\dfrac{K}{1+Ae^{-kt}}$ $\quad$ *for* $P(0)=400,\ P(1)=1200$ *and* $K=10000$,

then $A=\dfrac{K-P(0)}{P(0)}=\dfrac{10000-400}{400}=24$

$$P(t)=\frac{10000}{1+24e^{-kt}}$$

Hence, $P(1)=\dfrac{10000}{1+24e^{-k}}=1200,$ *solving this equation* $e^{-k}=\dfrac{22}{72}$

$$namely,\ k=-\ln\frac{22}{72}\approx 1.185624$$

Therefore, $P(t)=\dfrac{10000}{1+24\left(\dfrac{22}{72}\right)^{t}}$

$P(t)=5000$ *It implies that*

b) $24\left(\dfrac{22}{72}\right)^{t}=1,$ *Thus* $t=\dfrac{\ln\dfrac{1}{24}}{\ln\dfrac{22}{72}}\approx 2.680491\ (years)$