a.) Stel $y(t) =$ aantal klanten tot en met dag t.

$$\lim_{t \to +\infty} y(t) = 100.000 = 10^5$$

$$y' \sim y \cdot (10^5 - y)$$

$$y' = k \cdot y \cdot (10^5 - y)$$

b.) $y(t=0) = 10$ en $y'(t=0) = \dfrac{dy}{dt}(t=0) = 0,5$

$$\frac{dy}{dt} = k \cdot y \cdot (10^5 - y)$$

$$\frac{dy}{y \cdot (10^5 - y)} = k \cdot dt$$

$$\int \frac{dy}{y \cdot (10^5 - y)} = \int k \cdot dt$$

$$-\frac{1}{10^5} \cdot \ln\left(\frac{|y - 10^5|}{|y|}\right) = k \cdot t + C$$

$\hookrightarrow y > 0$, dus $|y| = y$

$$y < 10^5 \text{ dus } |y - 10^5| = |10^5 - y| = 10^5 - y$$

p2

$$-\frac{1}{10^5} \cdot \ln\left(\frac{10^5 - y}{y}\right) = k \cdot t + C$$

$$\ln\left(\frac{10^5 - y}{y}\right) = -10^5 \cdot (k \cdot t + C) = -10^5 \cdot k \cdot t - 10^5 \cdot C$$

$$\frac{10^5 - y}{y} = e^{-10^5 \cdot k \cdot t - 10^5 \cdot C} = e^{-10^5 \cdot k \cdot t} \cdot \underbrace{e^{-10^5 \cdot C}}_{= K}$$

$$\frac{10^5 - y}{y} = K \cdot e^{-10^5 \cdot k \cdot t}$$

$$10^5 - y = y \cdot K \cdot e^{-10^5 \cdot k \cdot t}$$

$$10^5 = y \cdot K \cdot e^{-10^5 \cdot k \cdot t} + y = y \cdot \left[K \cdot e^{-10^5 \cdot k \cdot t} + 1\right]$$

$$y(t) = \frac{10^5}{1 + K \cdot e^{-10^5 \cdot k \cdot t}}$$

k en K bepalen met $y(t=0)=10$
en
$\Downarrow$ $y'(t=0)=0,5$

$$10 = \frac{10^5}{1+K \cdot \underbrace{e^0}_{=1}} \implies K = 9999$$

nu $\frac{dy}{dt} = k \cdot y \cdot (10^5 - y)$ gebruiken:

$$0,5 = k \cdot 10 \cdot (10^5 - 10)$$

$$k = 5,0005 \cdot 10^{-7}$$

$\Downarrow$

$$y(t) = \frac{10^5}{1 + 9999 \cdot e^{-10^5 \cdot 5,0005 \cdot 10^{-7} \cdot t}}$$

$$y(t) = \frac{10^5}{1 + 9999 \cdot e^{-5,0005 \cdot 10^{-2} \cdot t}}$$

d.) solve$(y(t) = 50000, t) \implies t = 184,186$ dagen