

Oef 13 p A. 25

geg: logistische groei

$$f(t) = \frac{M}{1 + b e^{-ct}}$$

$$M = 100$$

$$1980 \leftrightarrow t=0: f(0) = \frac{100}{1+b} = 80$$

$$2000 \leftrightarrow t=20: f(20) = \frac{100}{1+b e^{-c \cdot 20}} = 90$$

gevrr:  $t! f(t) = 95$

$$\text{Opl: } 100 = 80 + 80b \Leftrightarrow 80 = 20 \Leftrightarrow b = \frac{1}{4}$$

$$100 = 90 + 90 \cdot \frac{1}{4} e^{-c \cdot 20}$$

(2018)

$$\Leftrightarrow \frac{90}{4} (e^{-c})^{20} = 10$$

$$\Leftrightarrow (e^{-c})^{20} = \frac{4}{9}$$

$$\Leftrightarrow e^{-c} = \left(\frac{4}{9}\right)^{\frac{1}{20}}$$

$$f(t) = \frac{100}{1 + \frac{1}{4} \left(\frac{4}{9}\right)^{\frac{t}{20}}} = 95$$

$$\Leftrightarrow 100 = 95 + \frac{95}{4} \left(\frac{4}{9}\right)^{\frac{t}{20}}$$

$$\Leftrightarrow \frac{95}{4} \left(\frac{4}{9}\right)^{\frac{t}{20}} = 5$$

$$\Leftrightarrow \left(\frac{4}{9}\right)^{\frac{t}{20}} = \frac{20}{95} = \frac{4}{19}$$

$$\Leftrightarrow \frac{t}{20} \ln \frac{4}{9} = \ln \frac{4}{19}$$

$$\Leftrightarrow t = 20 \cdot \frac{\ln(4/19)}{\ln(4/9)} = 38,43$$