(1)

$P = Ce^{k(0)}$

$P = C$

$2P = Ce^{5k} \rightarrow 2P = Pe^{5k} \rightarrow 2 = e^{5k}$

$\ln 2 = 5k \ln e^{1} \rightarrow \frac{\ln 2}{5} = k$

$3P = Pe^{kt} \rightarrow 3 = e^{(\ln 2/5)t}$

$\ln 3 = \frac{\ln 2}{5}(t) \ln e^{1}$

$\frac{5 \ln 3}{\ln 2} = t$

$7.92 = t$

$4 = e^{[\ln(2)/5]t} \rightarrow \ln 4 = \frac{\ln(2)}{5} t$

$\frac{5 \ln 4}{\ln(2)} = t \rightarrow t = 10$

La población se triplica en 7.92 años y se cuadruplica en 10 años.

(2) $10,000 = P(3)$

$10,000 = C\, e^{[\ln(2)/5](3)}$

$\frac{10,000}{e^{[\ln(2)/5](3)}} = C$

a) $C = 6597.5396$

$P = C \rightarrow 6597 = P$

$P = 6597.5396\, e^{\ln(2)/5 \cdot (10)}$

(b) $P = 26390.1584$

$P = 6597.5396\, e^{\ln(2)/5\, t}$

$\ln P = \ln(6597.5396)(e)^{[\ln(2)/5]t}$

$$\ln P = \ln(6597.5396) + \ln e^{[\ln(2)/5]t}$$

$$\ln P = \ln(6597.5396) + \frac{\ln(2)}{5} t \ln e^{1}$$

$$\ln P = \ln(6597.5396) + \frac{\ln(2)}{5} t$$

$$\frac{P'}{P} = \frac{\ln(2)}{5}$$

$$P' = \frac{\ln(2)}{5}(P)$$

$$P' = \frac{\ln(2)}{5}\left[6597.5396\, e^{[\ln(2)/5]t}\right]$$

$$P'(10) = \frac{\ln(2)}{5}\left[6597.5396 * e^{[\ln(2)/5][10]}\right]$$

$$P'(10) = 3658.4527 \text{ P/año}$$

a) La población inicial es de 6597

b) La población en (2639) 10 años será de 26 390

c) La población crece a una velocidad de 3658 P/año

(3) $k = 0.15$

$P_0 = 500$

$500 = C e^{k(0)}$

$500 = C$

15% = 500 * 0.15

15% = 75

$575 = 500 e^{k(10)}$

$\frac{575}{500} = e^{10k} \rightarrow 1.15 = e^{10k}$

$\ln 1.15 = 10k \ln e^1 \rightarrow \frac{\ln(1.15)}{10} = k$

$k = 0.0139$

$P = 500 e^{0.0139(30)} = 758.7012$

$P = 759$

$P = 500 e^{0.0139t}$

$P' = 0.0139 [500 e^{0.0139t}]$

$P'(30) = 0.0139 [500 e^{0.0139(30)}]$

$P'(30) = 10.5459 \approx 10$ %/año

a) La población pasada los 30 años es de 759 ~~años~~ personas

b) La población en 30 años está creciendo a 10 P/año.

(4) 400 = bacterias → 3 = h

2,000 = bacterias → 10 = h

$400 = c e^{3k}$

$2{,}000 = c e^{10k}$

$\frac{2{,}000 = c e^{10k}}{400 = c e^{3k}}$

$5 = e^{7k} \rightarrow \ln 5 = 7k \ln e^1$

$\frac{\ln 5}{7} = k$

$0.23 = k$

$400 = c e^{0.23(3)} \rightarrow 400 = c e^{0.69}$

$\frac{400}{e^{0.69}} = c \rightarrow c = 200.6304$

$P = 200.6304\, e^{0.23(t)}$

$P = 200.6304\, e^{0.1}$

$P = 200.6304$

$P = 201$

La población inicial de bacterias es de 201