See next page.

2. At time t = 0 minutes, a colony of E. coli has 10000 cells. The population is growing exponentially, and after 60 minutes it has 90000 members. Find a function of the form

$$p(t) = C \, 10^{at}$$

that describes the population size.

3. The function $f(x) = 2^{-3x}$ can be written in the form $f(x) = 10^{-ax}$ for a certain constant *a*. Determine the value of *a*.

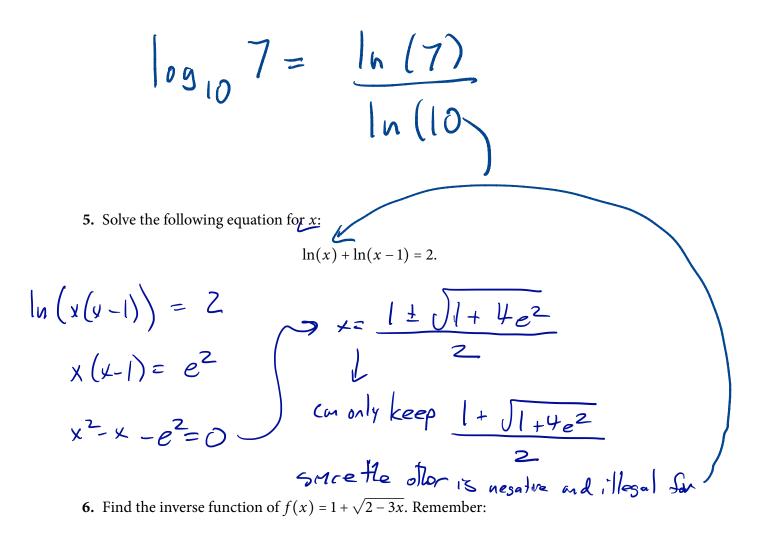
$$z^{-3x} = 10^{-ax}$$

-3x ln(z) = -ax ln(10)
$$a = \frac{3\ln(z)}{\ln(10)}$$

 $m(t) = C \cdot (\frac{1}{2})^{at}$, half-life: 1/a **l**'): $m(0) = 100; m(0) = C \cdot | = C$ C = 100=7 m(1) = 97.7; $m(1) = 100(\frac{1}{2})^{a}$ $100\left(\frac{1}{z}\right)^{a} = 97.7$ $(\frac{1}{2})^{a} = 0.977$ $a \log_{10}(\frac{1}{2}) = 0.977$ ニフ $\frac{1}{a} = \frac{\log_{10}(1/2)}{0.977} \approx 29.78 \text{ years}$

C. 10° t P(E) =z)P(0) = 10000 given P(60) = 90000 $P(0) = C \cdot 10^{a \cdot 0} = C = 7C = 10000$ $P(60) = 10000 10^{a.60}$ Also, $10000 10^{ab0} = 40000$ So $10^{a\cdot 60} = 9$ $a \cdot 60 = \log_{10} 9$ $a = \frac{\log_{10} q}{66} \approx 0.015q$

4. Use the change of base formula to rewrite $\log_{10}(7)$ in terms of the natural logarithm, ln.



- a) Write y = f(x).
- b) Solve for *x*.
- c) The resulting expression in terms of *y* is $f^{-1}(y)$.

