8. [11 points]

a. [7 points] In 2000, Jesse deposited 5 thousand dollars in a bank account with a continuous interest rate of 13% per year. Ten years later, she deposited 7 thousand dollars in the same account. Suppose that Jesse does not withdraw or deposit any more money into the account.

i) How much money was in the bank account, right before Jesse deposited the 7 thousand dollars? Your answer must be exact or accurate up to the closest cent. Show all your work.

Solution: He will have $5000e^{0.13(10)} \approx 18,346.48$ dollars.

ii) What is the balance, in dollars, in the bank account 16 years after the initial deposit? Your answer must be exact or accurate up to the closest cent. Show all your work.

Solution: He will have $(5000e^{0.13(10)} + 7000)e^{0.13(6)} \approx 55,292.65$ dollars.

b. [4 points] Solve for x in the following equation. Your answer must be in **exact form**. Show all your work carefully to receive full credit.

$$\ln\left(\frac{1}{2}e^{-0.3x} + 1\right) = 4.$$

Solution:

$$\ln\left(\frac{1}{2}e^{-0.3x} + 1\right) = 4$$

$$\frac{1}{2}e^{-0.3x} + 1 = e^4$$

$$e^{-0.3x} = 2(e^4 - 1)$$

$$-0.3x = \ln(2(e^4 - 1))$$

$$x = -\frac{1}{0.3}\ln(2(e^4 - 1))$$