1. [12 points] In each of the following equations, solve for all possible values of x. Be sure to show your work and write your final answer in the blank in **exact** form. If there are no solutions, write "no solutions" in the blank.

a. [4 points] $\ln(2e^x - 5) = x$.

$x =$ $\ln 5$

Solution: Taking e to both sides, we get $2e^x - 5 = e^x$. After combining terms we have $e^x = 5$, so $x = \ln 5$.

b. [4 points] $e^{x+8} = 2^{7x-6}$.

$x =$ $\frac{8+6\ln 2}{7\ln 2-1}$

Solution: Applying ln to both sides and using properties of logs, we have

$$x + 8 = (7x - 6)\ln 2.$$

If we combine like terms, we get

$$(7\ln 2)x - x = 8 + 6\ln 2.$$

Factoring x out of the left hand side of the equation and dividing by what remains, we have that

$$x = \frac{8 + 6\ln 2}{7\ln 2 - 1}.$$

c. [4 points] $\log(2x^2 - 1) = 0$.

$x =$ ± 1

Solution: Taking 10 to both sides, we get $2x^2 - 1 = 1$. So $2x^2 = 2$, and $x = \pm 1$.