7. [12 points] Solve for x the following equations algebraically. Show all your work step by step and write your answers in **exact form** to receive full credit.

a. [4 points] $4(10^{2\log(x)+1}) = 3$

Solution:

$$\begin{aligned} 4(10^{2\log(x)+1}) &= 3 \\ 10^{2\log(x)+1} &= 0.75 \\ 2\log(x)+1 &= \log(0.75) \\ \log(x) &= \frac{\log(0.75)-1}{2} \\ x &= 10^{\frac{\log(0.75)-1}{2}} \end{aligned}$$

b. [4 points] In this problem k is a constant, hence your answer may depend on k.

$$e^{kx} = 2e^{x+2}$$

Solution:

$$\begin{aligned} e^{kx} &= 2e^{x+2} \\ kx &= \ln(2e^{x+2}) \\ kx &= \ln(2) + \ln(e^{x+2}) \\ kx &= \ln(2) + x + 2 \\ kx - x &= \ln(2) + 2 \\ (k-1)x &= \ln(2) + 2 \\ x &= \frac{\ln(2)+2}{k-1}. \end{aligned}$$

c. [4 points] $\log(100x) = 2 + 2\log(x^2)$

Solution:

$$\begin{aligned} \log(100x) &= 2 + 2\log(x^2) \\ \log(100) + \log(x) &= 2 + 4\log(x) \\ 2 + \log(x) &= 2 + 4\log(x) \\ \log(x) &= 0 \\ x &= 1 \end{aligned}$$