Instructions: Show all work. Use exact answers unless specifically asked to round. Answer all parts of each question.

1. Solve each equation for x.
   a. $e^{4x} + 5e^{2x} - 24 = 0$

   $u = e^{2x}$

   $u^2 + 5u - 24 = 0$

   $(u + 8)(u - 3) = 0$

   $u = -8, \ u = 3$

   $e^{2x} = -8$ no solution

   $e^{2x} = 3$

   $2x = \ln 3$

   $\boxed{x = \tfrac{1}{2}\ln 3}$

   b. $\log x + \log(x + 3) = \log 10$

   $\log(x(x+3)) = \log 10$

   $x^2 + 3x - 10 = 0$

   $(x + 5)(x - 2) = 0$

   $x = -5, \ x = 2$

   $\log(-5)$ not defined

   $\boxed{x = 2}$

2. Use Newton's Law of Cooling $T = C + (T_0 - c)e^{kt}$ to solve: a pizza removed from the oven has a temperature of $450°F$. It is left sitting in a room that has a temperature of $70°F$. After five minutes the pizza is $300°F$. Find a model for the temperature of the cooling pizza and use that to find the temperature of the pizza after 20 minutes.

   $450 = T = 70 + (450 - c)e^{k\cdot 0}$

   $T = 70 + 380 e^{kt}$

   $300 = 70 + 380 e^{5k}$

   $230 = 380 e^{5k}$

   $\dfrac{230}{380} = e^{5k}$

   $\ln\left(\dfrac{230}{380}\right) = 5k$

   $k = -0.100418\ldots$

   $T = 70 + 380 e^{-0.1004 t}$

   $T(20) = 70 + 380 e^{-0.1004(20)}$

   $= 120.99887\ldots$

   $\approx 121°$