1. [5 points] For each of the statements below, circle "**True**" if the statement is *definitely* true. Otherwise, circle "**False**". You do not need to show any work for this problem.

a. [1 point] If a function has more than one zero, then the function is not invertible.

[True] False

b. [1 point] If $x > 1$, then $100x^{100000} > e^{0.0001x}$.

True [False]

c. [1 point] If $h(t) = \ln(t)$ then $h^{-1}(t) = \dfrac{1}{\ln(t)}$.

True [False]

d. [1 point] If a function is concave up, then the function is increasing.

True [False]

e. [1 point] If $f(x)$ and $g(x)$ are both even functions, then the function $f(g(x))$ is also an even function.

[True] False

2. [6 points] Solve each of the equations below. *Show your work step-by-step and write the solutions in* **exact form** *in the answer blanks provided.*

a. [3 points] $5e^{2t+7} = 3(4^t)$

Solution: We first divide both sides of this equation by 5 to find $e^{2t+7} = 0.6(4^t)$. Then we use logarithms to find t.

$$\ln(e^{2t+7}) = \ln\left(0.6(4^t)\right)$$
$$2t + 7 = \ln(0.6) + \ln(4^t) = \ln(0.6) + t\ln(4)$$
$$2t - t\ln(4) = \ln(0.6) - 7$$
$$t(2 - \ln(4)) = \ln(0.6) - 7 \text{ so } t = \frac{\ln(0.6) - 7}{2 - \ln(4)}$$

Answer: $t = \dfrac{\ln(0.6) - 7}{2 - \ln(4)}$

b. [3 points] $\log(w) + \log(w + 3) = 1$

Solution: We apply a basic property of logarithms and then use the definition or the logarithm (or exponentiate) to solve for w.

$$\log(w) + \log(w + 3) = 1$$
$$\log(w(w + 3)) = 1$$
$$w(w + 3) = 10^1$$
$$w^2 + 3w = 10$$
$$w^2 + 3w - 10 = 0$$
$$(w - 5)(w + 2) = 0$$
$$w = 5 \text{ or } w = -2$$

However, note that $w = -2$ is not a solution to the original equation because -2 is not in the domain of $\log w$. Hence the only solution is $w = 5$.

Answer: $w =$ 5