5.4.97, 101, 105

Exercises 5.4.97, 5.4.101, and 5.4.105

Solve each equation: (97) $\log_4(64) = x$, (101) $e^{3x} = 10$, and (105) $\log_7(x^2+4) = 2$.

Solution

In each problem, we use the definition of logarithm that $y = \log_a(x)$ if and only if $a^y = x$.

(97) Now $\log_4(64) = x$ means $4^x = 64$. Since $4^3 = 64$ (and exponential functions are one-to-one) then $\boxed{x = 3}$.

(101) Next, $e^{3x} = 10$ means $\log_e(10) = 3x$ or $\ln(10) = 3x$ and so $\boxed{x = \frac{1}{3}\ln(10)}$.

(105) Again, $\log_7(x^2+4) = 2$ means $7^2 = x^2 + 4$ or $49 = x^2 + 4$ or $x^2 = 45$. Therefore, $x = \pm\sqrt{45} = \pm\sqrt{9 \cdot 5} = \pm 3\sqrt{5}$. That is, $\boxed{x = -3\sqrt{5} \text{ or } x = 3\sqrt{5}}$. □