6.6 Practice Problems

Solve each exponential equation.

1. $4^{2x+4}=64$

$4^{2x+4}=4^3$

$2x+4=3$

$-4\ \ -4$

$\frac{2x}{2}=\frac{-1}{2}$

$x=\frac{1}{2}$

2. $3^x=19$

$\log_3 19=x$

3. $4^{x+5}=5^{2x-3}$

$\ln 4^{x+5}=\ln 5^{2x-3}$

$(x+5)\ln 4=(2x-3)\ln 5$

$x\ln 4+5\ln 4=2x\ln 5-3\ln 5$

$5\ln 4+3\ln 5=2x\ln 5-x\ln 4$

$\frac{5\ln 4+3\ln 5}{2\ln 5-\ln 4}=\frac{x(2\ln 5-\ln 4)}{2\ln 5-\ln 4}$

$x=\frac{5\ln 4+3\ln 5}{2\ln 5-\ln 4}$

4. $30e^{2x}-5=355$

$+5\ \ +5$

$\frac{30e^{2x}}{30}=\frac{360}{30}$

$e^{2x}=12$

$\frac{\ln 12}{2}=\frac{2x}{2}$

$\frac{\ln 12}{2}=x$

5. $3^{2x}-8\cdot 3^x+15=0$

let $u=3^x$ $u^2=3^{2x}$

$u^2-8u+15=0$

$(u-5)(u-3)=0$

$u-5=0$ $u-3=0$

$u=5$ $u=3$

Sub back

$3^x=5$

$\ln 3^x=\ln 5$

$\frac{x\ln 3}{\ln 3}=\frac{\ln 5}{\ln 3}$

$x=\frac{\ln 5}{\ln 3}$

$3^x=3$

$\ln 3^x=\ln 3$

$\frac{x\ln 3}{\ln 3}=\frac{\ln 3}{\ln 3}$

$x=1$

Solve each logarithmic equation in problems 6 - 10. Be sure to reject any value of x that is not in the domain of the original logarithmic expression.

6. $\log_3(x+5)=4$

$3^4 = x+5$

$-5 \quad -5$

$81-5=x$

$76=x$

7. $2\log_7 x=\log_7 64$

$\log_7 x^2 = \log_7 64$

$x^2=64$

$x=\pm 8$ $\quad (x=8)$

8. $\log_6 x+\log_6(x+5)=2$

$\log_6 x(x+5)=2$

$6^2=x(x+5)$

$36=x^2+5x$

$0=x^2+5x-36$

$0=(x+9)(x-4)$

$x+9=0 \quad x-4=0$

$x=-9 \quad x=4$

9. $\log(x-9)=\log(x+4)+\log 3$

$\log(x-9)=\log 3(x+4)$

$x-9=3x+12$

$-x \quad -x$

$-9=2x+12$

$-12 \quad -12$

$\frac{2x}{2}=\frac{-21}{2}$

$x=\frac{-21}{2}$ No solution

10. $\log_3(x-2)+1=\log_3(3x+1)$

$1=\log_3(3x+1)-\log_3(x-2)$

$1=\log_3\left(\frac{3x+1}{x-2}\right)$

$3^1=\frac{3x+1}{x-2}$

$3(x-2)=3x+1$

$3x-6=3x+1$

$-3x \quad -3x$

$-6=1$

No solution