

May 9

## Solve Exponential Equations with Binomial Exponents

(Ex 1) Solve:  $b^{x+3} = 22$   
 $\ln b^{x+3} = \ln 22$

$$\frac{(x+3) \cdot \ln b}{\ln b} = \frac{\ln 22}{\ln b}$$

$$\begin{array}{r} x+3 = 1.73 \\ \textcircled{3} \quad -3 \\ \hline x = -1.27 \end{array}$$

(Ex 2) Solve:  $7 = 3^{2x-1}$   
 $\ln 7 = \ln 3^{2x-1}$

$$\frac{\ln 7}{\ln 3} = \frac{(2x-1) \cdot \ln 3}{\ln 3}$$

$$\begin{array}{r} 1.77 = 2x \\ +1 \end{array}$$

$$\frac{2.77}{2} = \frac{2x}{2}$$

$$\boxed{1.39 = x}$$

Ex3) Solve:  $\frac{5e^{4x+2}}{5} = \frac{35}{5}$

$$e^{4x+2} = 7$$

$$\ln e^{4x+2} = \ln 7$$

$$\frac{(4x+2) \cdot \ln e}{\ln e \ln e} = \frac{\ln 7}{\ln e}$$

$$\frac{4x+2}{-2} = \frac{1.95}{-2}$$

$$\frac{4x}{4} = \frac{-0.5}{4}$$

$$\boxed{x = -0.125}$$

Ex4) Solve:  $8^{x-6} = 4^x$

$$\ln 8^{x-6} = \ln 4^x$$

$$\frac{(x-6) \cdot \ln 8}{\ln 4} = \frac{x \cdot \ln 4}{\ln 4}$$

$$(x-6) \cdot 1.5 = x$$

$$\frac{1.5x - 9}{-1.5x} = \frac{x}{-1.5x}$$

$$\frac{-9}{-1.5} = \frac{-1.5x}{-1.5}$$

$$\boxed{18 = x}$$

\* If  $x$  is on both sides, it doesn't matter which  $\ln$  you divide by. It is a little easier if you divide by the smaller one.

Ex 5 Solve:  $5^{x+9} = 12^{3x-4}$   
 $\ln 5^{x+9} = \ln 12^{3x-4}$

$$\frac{(x+9) \cdot \ln 5}{\ln 5} = \frac{(3x-4) \cdot \ln 12}{\ln 5}$$

$$x+9 = (3x-4) \cdot (1.54)$$

$$x+9 = 4.62x - 6.16$$

$$\begin{array}{r} x+9 \\ -9 \end{array} \qquad \begin{array}{r} 4.62x - 6.16 \\ -9 \end{array}$$

$$\begin{array}{r} x = 4.62x - 15.16 \\ -4.62x \quad -4.62x \end{array}$$

$$\begin{array}{r} -3.62x = -15.16 \\ -3.62 \quad -3.62 \end{array}$$

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$$\boxed{x = 4.19}$$