

# EQUALITY OF EXPONENTS

If  
 $b^P = b^Q$   
 THEN  
 $P = Q$

①  $2^x = 16$

$2^x = 2^4$   
 $X = 4$

②  $3^{5x-1} = 9$

$3^{5x-1} = 3^2$   
 $5x-1 = 2$   
 $5x = 2+1$   
 $5x = 3$   
 $\frac{5x}{5} = \frac{3}{5}$   
 $X = \frac{3}{5}$

③  $9^{x+2} = 27$

$3^{2(x+2)} = 3^3$   
 $2(x+2) = 3$   
 $2x+4 = 3$   
 $2x = 3-4$   
 $2x = -1$   
 $X = -\frac{1}{2}$

④  $5^x = \frac{1}{\sqrt[4]{5}}$

$5^x = \frac{1}{5^{\frac{1}{4}}}$   
 $5^x = 5^{-\frac{1}{4}}$   
 $X = -\frac{1}{4}$

⑤  $16^{x-2} = 8^{3x-1}$

$2^{4(x-2)} = 2^{3(3x-1)}$

$4(x-2) = 3(3x-1)$

$4x - 8 = 9x - 3$

$-8 + 3 = 9x - 4x$

$-5 = 5x$

$-\frac{5}{5} = \frac{5x}{5}$

$-1 = x$

## SOLVING EXPONENTIAL EQUATIONS

95%

1. GET THE PART WITH THE VARIABLE IN EXPONENT BY ITSELF
2. TAKE LN OF BOTH SIDES
3. USE PROP. OF LOGS TO GET VARIABLE OUT OF EXPONENT
4. SOLVE FOR X

⑥  $15^x = 112$

$\ln 15^x = \ln 112$

$x \ln 15 = \ln 112$

$\frac{x \ln 15}{\ln 15} = \frac{\ln 112}{\ln 15}$

$X = \frac{\ln 112}{\ln 15}$

$7x = 14$

⑦  $e^{7x-1} = 53$

$e^{7x-1} = 53 + 1$

$e^{7x-1} = 54$

$\ln e^{7x-1} = \ln 54$

$7x-1 = \ln 54$

$7x = 1 + \ln 54$

$\frac{7x}{7} = \frac{1 + \ln 54}{7}$

$X = \frac{1 + \ln 54}{7}$

⑧  $4^{x-7} = 13$

$\ln 4^{x-7} = \ln 13$

$(x-7) \ln 4 = \ln 13$

$x \ln 4 - 7 \ln 4 = \ln 13$

$x \ln 4 = \ln 13 + 7 \ln 4$

$\frac{x \ln 4}{\ln 4} = \frac{\ln 13 + 7 \ln 4}{\ln 4}$

$X = \frac{\ln 13 + 7 \ln 4}{\ln 4}$

$X = \frac{\ln(13 \cdot 4^7)}{\ln 4}$

⑨  $2^{8x-1} = 3^{x-4}$

$\ln 2^{8x-1} = \ln 3^{x-4}$

$(8x-1) \ln 2 = (x-4) \ln 3$

$8x \ln 2 - \ln 2 = x \ln 3 - 4 \ln 3$

$8x \ln 2 - x \ln 3 = \ln 2 - 4 \ln 3$

$x(8 \ln 2 - \ln 3) = \ln 2 - 4 \ln 3$

$\frac{x(8 \ln 2 - \ln 3)}{8 \ln 2 - \ln 3} = \frac{\ln 2 - 4 \ln 3}{8 \ln 2 - \ln 3}$

$X = \frac{\ln 2 - 4 \ln 3}{8 \ln 2 - \ln 3}$