

October 16

Solve Exponential Equations

Ex1) Solve: $3^x = 7$

Property: $\log_b M^x = x \cdot \log_b M$

Translation: If you are taking any kind of log, exponents can be brought down in front of the log as multiplication.

Step 1: Take ln of both sides.

$$3^x = 7$$
$$\ln 3^x = \ln 7$$

Step 2: "Power Down"

$$\frac{x \cdot \ln 3}{\ln 3} = \frac{\ln 7}{\ln 3}$$

Step 3: Divide to get rid of ln's, then finish solving as needed.

$$x = 1.77$$

Ex2) Solve: $13 = 4^x$

$$\ln 13 = \ln 4^x$$

$$\frac{\ln 13}{\ln 4} = \frac{x \cdot \ln 4}{\ln 4}$$

$$1.85 = x$$

Ex 3) Solve: $4^{9x} = 37$

$$\ln 4^{9x} = \ln 37$$

$$\frac{9x \cdot \ln 4}{\ln 4} = \frac{\ln 37}{\ln 4}$$

$$\cancel{9x} = \frac{2.60}{9}$$

$$\boxed{x = .29}$$

Ex 4) Solve: $6 \cdot 5^{3x} = 53$

← Get term alone first!

$$\frac{6 \cdot 5^{3x}}{6} = \frac{53}{6}$$

$$5^{3x} = 9$$

$$\ln 5^{3x} = \ln 9$$

$$\frac{3x \cdot \ln 5}{\ln 5} = \frac{\ln 9}{\ln 5}$$

$$\cancel{3x} = \frac{1.37}{3}$$

$$\boxed{x = .46}$$