

May 8

Solve Exponential Equations

$$x^2 = 8$$

↑
not an exponential equation

$$2^x = 8$$

↑
is an exponential equation

← variable is in the exponent

(Ex1) Solve: $2^x = 8$

*Property: If you have a log, you can bring down an exponent and make it a regular number.
"Power Down"

Step 1: Get base and exponent alone.

$$2^x = 8$$

Step 2: Take natural log of both sides.

$$\ln 2^x = \ln 8$$

Step 3: Power down.

$$\frac{x \cdot \ln 2}{\ln 2} = \frac{\ln 8}{\ln 2}$$

Step 4: Finish solving.

$$\boxed{x = 3}$$

Ex2) Solve: $3 = 8^x$

$$\ln 3 = \ln 8^x$$

$$\frac{\ln 3}{\ln 8} = \frac{x \cdot \ln 8}{\ln 8}$$

$$.53 = x$$

Ex3) Solve: $6^{2x} = 17$

$$\ln 6^{2x} = \ln 17$$

$$\frac{2x \cdot \ln 6}{\ln 6} = \frac{\ln 17}{\ln 6}$$

$$\frac{2x}{2} = \frac{1.58}{2}$$

$$x = .79$$

Ex4) Solve: $10 = e^{3x}$

$$\ln 10 = \ln e^{3x}$$

$$\frac{\ln 10}{\ln e} = \frac{3x \cdot \ln e}{\ln e}$$

$$\frac{2.30}{3} = \frac{3x}{3}$$

$$.77 = x$$

Ex 5) Solve: $\frac{12 \cdot 8^{3x}}{12} = \frac{24}{12}$

$$8^{3x} = 2$$

$$\ln 8^{3x} = \ln 2$$

$$\frac{3x \cdot \ln 8}{\ln 8} = \frac{\ln 2}{\ln 8}$$

$$\frac{3x}{3} = \frac{.33}{3}$$

$$\boxed{x = .11}$$

Ex 6) Solve: $5 \cdot 6^x = 14$

$$\frac{5 \cdot 6^x}{5} = \frac{14}{5}$$

$$6^x = 2.8$$

$$\ln 6^x = \ln 2.8$$

$$\frac{x \cdot \ln 6}{\ln 6} = \frac{\ln 2.8}{\ln 6}$$

$$\boxed{x = .57}$$