**41.** $\ln 3 \cdot x^2 \cdot y$

$\ln 3 + \ln x^2 + \ln y$

$\ln 3 + 2 \ln x + \ln y$

## 9.4 Solving Exponential + logarithmic equations

### Prop. of logarithmic + exponential equations

1. $a^x = a^y$ if + only if $x = y$

2. $\log_a x = \log_a y$ if + only if $x = y$

Examples : solve :

$$3^{x+1} = 3^{3x-7}$$

$$x+1 = 3x-7$$
$$\underline{-x \qquad -x}$$
$$1 = 2x - 7$$
$$\underline{+7 \qquad\qquad +7}$$
$$\frac{8}{2} = \frac{2x}{2}$$

$$\boxed{x = 4}$$

must check answer!

Ex: $\log_5(2x+7) = \log_5 5$

$$2x + 7 = 5$$
$$-7 \quad -7$$

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

$$\boxed{x = -1}$$

# Inverse Properties of logs & exponentials

1. $\log_a a^x = x$

2. $\ln e^x = x$

3. $a^{\log_a x} = x$

4. $e^{\ln x} = x$

Ex: Solve:

$$\frac{2e^x}{2} = \frac{10}{2}$$

$$\ln(e^x) = \ln(5)$$

$$x = 1.61$$

check:

$$2e^{\ln 5} = 10$$

$$2(5) = 10$$

$$10 = 10 \checkmark$$

$$\log_3\left(3^{x+2}\right) = \log_3 9$$

$$x + 2 = \frac{\ln 9}{\ln 3}$$

$$x + 2 = 2$$
$$\phantom{x + 2 = }{-2}\phantom{=}{-2}$$

$$\boxed{x = 0}$$

$$2 \ln x + 4 = 5$$
$$\phantom{2\ln x} -4 \quad -4$$

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

$$e^{\ln x = \frac{1}{2}}$$
$$e$$

$$\boxed{x = 1.65}$$

$$\frac{3 \log_{10} x}{3} = \frac{6}{3}$$

$$10^{\log_{10} x} = 10^{2}$$

$$\boxed{X = 100}$$

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

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

$$x(x-5) = 36$$

$$x^2 - 5x = 36$$
$$-36 \quad -36$$

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

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

$$x-9=0 \quad \text{or} \quad x+4=0$$

$$x = 9 \quad \text{or} \quad x = -4$$

p. 621

8 - 100 even