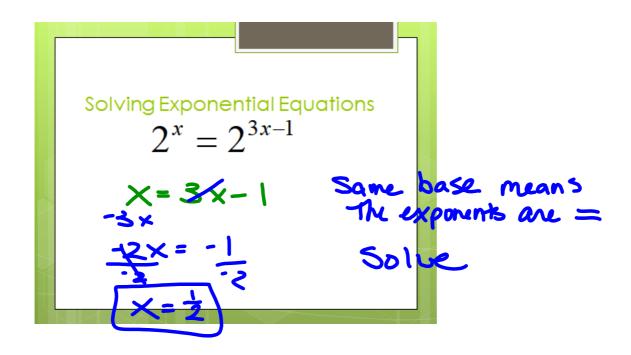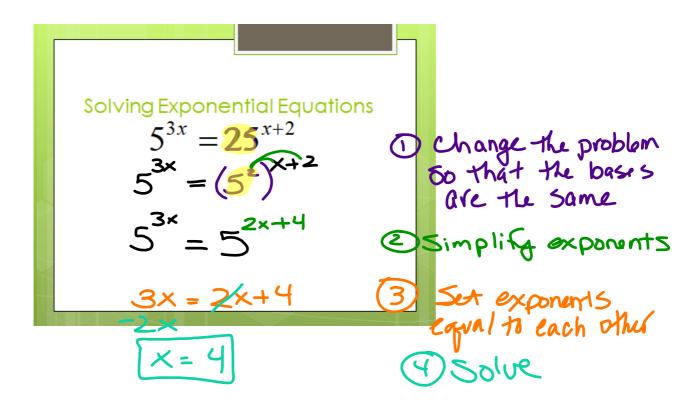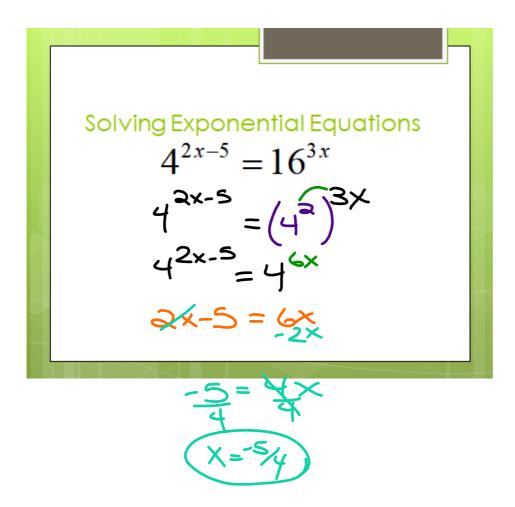Solving Exponential Equations

$$2^x = 2^4$$

$X = 4$

If the bases are the same, then The exponents must be equal

Solving Exponential Equations

$$2^x = 2^{3x-1}$$

$x = 3x - 1$

$-3x$

$\dfrac{2x}{-2} = \dfrac{-1}{-2}$

$\boxed{x = \tfrac{1}{2}}$

Same base means
The exponents are $=$

Solve

Solving Exponential Equations

$$5^{3x} = 25^{x+2}$$

$$5^{3x} = (5^2)^{x+2}$$

$$5^{3x} = 5^{2x+4}$$

$$3x = 2x+4$$

$$-2x$$

$$\boxed{x = 4}$$

① Change the problem so that the bases are the same

② Simplify exponents
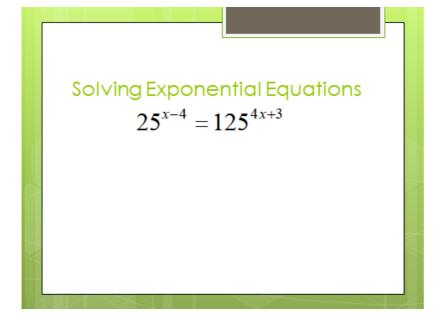
③ Set exponents equal to each other

④ Solve

Solving Exponential Equations

$$4^{2x-5} = 16^{3x}$$

$$4^{2x-5} = (4^2)^{3x}$$

$$4^{2x-5} = 4^{6x}$$

$$2x - 5 = 6x$$
$$-2x \qquad -2x$$

$$\frac{-5}{4} = \frac{4x}{4}$$

$$\boxed{x = -5/4}$$

Solving Exponential Equations

$$25^{x-4} = 125^{4x+3}$$

Solving Exponential Equations

$$2^{x-1} = \left(\frac{1}{8}\right)^{x+3}$$

$$2^{x-1} = \left(\frac{1}{2^3}\right)^{x+3}$$

$$2^{x-1} = \left(2^{-3}\right)^{x+3}$$

$$2^{x-1} = 2^{-3x-9}$$

$$x-1 = -3x-9$$

$+3x$

$$4x - x = -9$$

$+1$

$$\frac{4x}{4} = \frac{-8}{4}$$

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

Solving Exponential Equations

$$\left(\frac{1}{64}\right)^{x^2} = \left(\frac{1}{16}\right)^{8}$$

$$\left(\frac{1}{4^3}\right)^{x^2} = \left(\frac{1}{4^2}\right)^{8}$$

$$\left(4^{-3}\right)^{x^2} = \left(4^{-2}\right)^{8}$$

$$4^{-3x^2} = 4^{-16}$$

$$\frac{-3x^2}{-3} = \frac{-16}{-3}$$

$$\sqrt{x^2} = \sqrt{\frac{16}{3}}$$

$$x = \pm \frac{4}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$x = \pm \frac{4\sqrt{3}}{3}$$

Check both answers

Solving Exponential Equations

$$4^x \cdot \left(\frac{1}{64}\right)^{5x-3} = \left(\frac{1}{16}\right)^{x-6}$$

$$4^x \left(\frac{1}{4^3}\right)^{5x-3} = \left(\frac{1}{4^2}\right)^{x-6}$$

$$4^x \left(4^{-3}\right)^{5x-3} = \left(4^{-2}\right)^{x-6}$$

$$4^x \left(4^{-15x+9}\right)$$

$$4^{x-15x+9} = 4^{-2x+12}$$

Solve:

$$(0.25)^{7x} = 32^{x-7}$$

$$\frac{25}{100}$$

$$\left(\frac{1}{4}\right)^{7x} = 32^{x-7}$$

$$\left(\frac{1}{2^2}\right)^{7x} = \left(2^5\right)^{x-7}$$

$$\left(2^{-2}\right)^{7x} = \left(2^5\right)^{x-7}$$

$$2^{-14x} = 2^{5x-35}$$

$$-14x = 5x - 35$$
$$-5x \quad -5x$$

$$\frac{-19x}{-19} = \frac{-35}{-19}$$

$$x = \frac{35}{19}$$