Lesson 5.9 Exponential Equations

Goal: Use equality of powers with a common base to solve exponential equations

An exponential equation is an equation that contains a variable in the $-e \times ponent + \cdots$

Some exponential equations can be solved *WITHOUT TECHNOLOGY* by writing both sides of the equation as powers of the <u>Same</u>.

Called Equating the Powers Equality of Powers with a Common Base If a^m=aⁿ, then m=n a>0, a=1

EXAMPLE 1 Since 4^x and 4^3 are both powers of 4, the exponents must be equal so the solution to $4^x = 4^3$ is x = 3.

EXAMPLE 2 Finding a Common Base Solve each of the following.

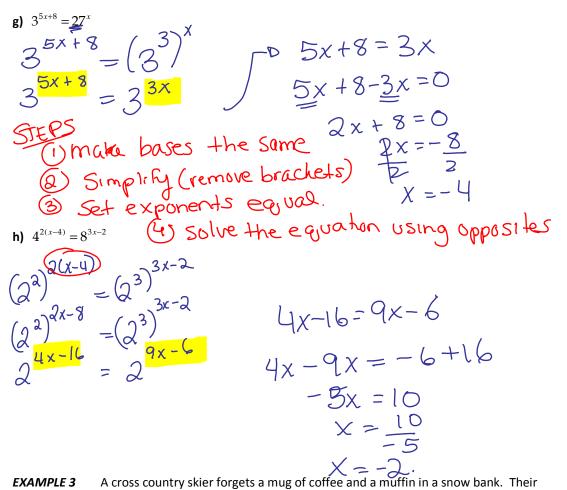
a) $5^x = 5^6$	b) $2^x = 32$	c) $2^x = \frac{1}{2}$
X=6	$a^{x} = a^{5}$	$2^{x} = 2^{-1}$
		d = d
	x=5	X = -)

d) $2^x = \frac{1}{4}$ $2^{x} = 2^{-2}$ X = -2

e)
$$\underline{7}^{3x-4} = \underline{49}$$

 $7^{3x-4} = 7^{2}$
 $3x - 4 = 7^{2}$
 $3x - 4 = 2$
 $3x = 2 + \frac{9}{3}$
 $3x = \frac{6}{3}$
 $x = 2$

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EXAMPLE 3 A cross country skier forgets a mug of coffee and a muffin in a snow bank. Their temperatures, in degrees Celsius, after t minutes can be modelled by the formulas: $T_{coffee} = 81 \times 3^{-2t}$ and $T_{muffin} = 27 \times 3^{-1}$. Determine when the coffee cools to the same temperature as the muffin.

The coffee = Truthin

$$51 \times 3^{-2t} = 27 \times 3^{-1}$$

 $3' \times 3^{-2t} = 3^{3} \times 3^{-1}$ + When multiplying
 $3^{4} - 2t = 3^{-1}$
 $4 - 2t = 3^{-1}$
 $4 - 2t = 3^{-1}$
 $4 - 2t = 2^{-1}$
 $4 - 2t = 2^{-1}$

Practice: Page 384 #1 – 3 (cd), 4, 5, 6, 7aceg, 10abd, 15, 16ab