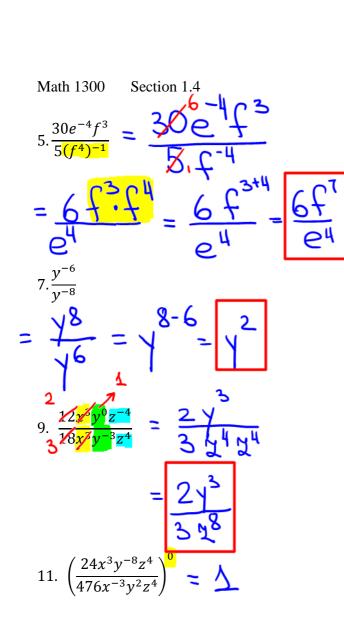
Math 1300 Section 1.4 Section 1.4: Exponents and Radicals Let n be a natural number. Then the exponential expression  $x^n$  is defined by  $x^n = x * x * x * ... * x$ .  $x^n$  is read as "x to the *n*th power". n times **Examples:**  $2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$ ,  $(-3)^2 = (-3)(-3) = 9$  $4^{3} = 4 \cdot 4 \cdot 4 = 64 \quad (-5)^{2} = (-5)(-5) = 25 \quad -5^{2} = -(5)(-5) = -25$ **Rules for Exponents: Multiplying Powers:**  $a^m \times a^n = a^{m+n}$ **Dividing Powers:** Negative Powers: 5 2 and Power Rule:  $(a^m)^n$  $= a^{mn}$ 3·5 15 2 = 2 Zero Power Rule: *Note:* If no power is shown, then the exponent is 1. **Examples:** Simply having no negative exponents.  $1.(4)(4^3) =$ 2. 4+2 16-8 -12 × -5 =



13.  $(6a^2b^{-2}c^4)^2$ 

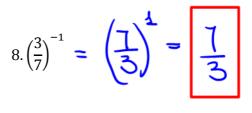
 $= 36 a^{4} b^{-4} c^{8}$  $= \frac{36 a^{4} c^{8}}{b^{4}}$ 

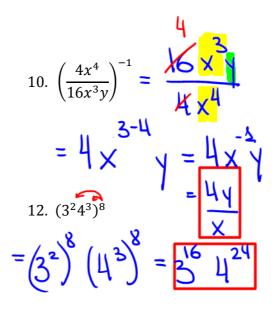
 $= (6)^{2} (a^{2})^{2} (b^{-2})^{2} (c^{4})^{2}$ 

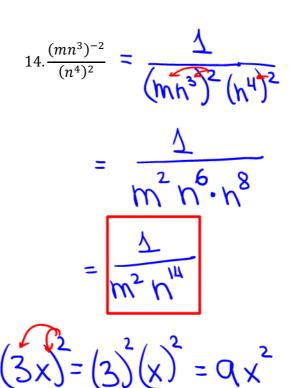
В. 6x с. з,

 $X^{-n} = \frac{1}{X^n} \quad \frac{1}{X^{-h}} = X^n$ 

 $6. \frac{3}{5^{-2}} = 3 \cdot 5^2 = 3 \cdot (25) = 75$ 







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Math 1300 Section 1.4 **Simplifying Radicals** 

 $(-4)^2 = (-4)(-4) = 16$ A number y is called the square root of a number x if  $y^2 = x$ .  $(4)^2 = (4)(4) = 16$ 

 $(-4)^2 = 4^2 = 16$ . So, 4 and -4 are both square roots of 16.

In general, if x > 0, then x has two square roots. However, we use the symbol  $\sqrt{x}$  for the "principal square root", which is the positive square root of x.

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**Examples:** Simplify the following.

1.  $\sqrt{36} = 6$ 

3. 
$$\sqrt{18} = \sqrt{9 \cdot 2}$$
  
 $= \sqrt{9 \cdot 2}$   
 $= 3\sqrt{2}$   
5.  $\sqrt{10^2} = 10$   
 $\sqrt{4^2} = 4$   
 $\sqrt{204}\sqrt{2} = 2014$   
Notation:  $x^{1/2} = \sqrt{x}$   
7.  $81^{1/2}$   
 $= \sqrt{81}$ 

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