

## 10.01 Exponentials Review

## Properties of Exponents:

Product of Powers	$X^m \cdot X^n = X^{m+n}$
Quotient of Powers	$\frac{X^m}{X^n} = X^{m-n}$
Power of a Product	$(Xy)^n = X^n \cdot y^n$
Power of a Quotient	$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$
Power of a Power	$(X^m)^n = X^{mn}$
Negative Exponent	$X^{-n} = \frac{1}{X^n}$
Zero Exponent	$X^0 = 1$
Rational Exponent	$X^{\frac{m}{n}} = \sqrt[n]{X^m}$

Rational      Radical

Date: \_\_\_\_\_

$$X^m \cdot X^n \neq X^{mn}$$

$$(x+y)^n \neq x^n + y^n$$

$$X^{4/3} \rightarrow \sqrt[3]{X^4}$$

Simplify. Your answers should only contain positive exponents.

1.  $(4a^3b^{-2})^3$

2.  $(x^3)^3 2x^{-1}$

3.  $\left(\frac{x^{-2}}{y^4}\right)^3$

4.  $\frac{a^4b^2}{ab^5}$

5.  $\frac{z}{(2z^0)^2}$

6.  $\left(\frac{3^{4x}}{3^{2x}}\right)^3$

Evaluate.

7.  $2^{-5}$

8.  $36^{1/2}$

9.  $27^{4/3}$

10.  $8^{-2/3}$

Solve.

11.  $10^{4x+3} = 10^{2x+23}$

12.  $3^x = 9^{x-2}$

13.  $25^{2x-4} = 125^{x+4}$

$$1) (4^3 a^3 b^{-2})^3 \rightarrow 4^9 a^9 b^{-6} \rightarrow \boxed{\frac{64a^9}{b^6}}$$

$$2) (x^3)^3 2x^{-1} \rightarrow x^9 \cdot 2x^{-1} \rightarrow \frac{x^9 \cdot 2}{x} \rightarrow \boxed{2x^8}$$

$$\hookrightarrow x^9 \cdot x^{-1} \rightarrow \boxed{2x^8}$$

$$3) \left(\frac{x^{-2}}{y^4}\right)^3 = \frac{x^{-6}}{y^{12}} \rightarrow \boxed{\frac{1}{x^6 y^{12}}}$$

$$4) \frac{a^4 b^2}{a^1 b^5} \rightarrow a^{3} b^{-3} \rightarrow \boxed{\frac{a^3}{b^3}}$$

$$5) \frac{z}{(2z^0)^2} \rightarrow \frac{z}{2^2 z^0} \rightarrow \boxed{\frac{z}{4}}$$

$$6) \left(\frac{3^{4x}}{3^{2x}}\right)^3 \rightarrow \frac{3^{12x}}{3^{6x}} \text{ or } 3^{12x} \cdot 3^{-6x} \rightarrow \boxed{3^{6x}}$$

$$7) 2^{-5} \rightarrow \frac{1}{2^5} \rightarrow \boxed{\frac{1}{32}}$$

$$8) 36^{1/2} \rightarrow \sqrt{36} \rightarrow \boxed{6}$$

$$9) 27^{4/3} \rightarrow (\sqrt[3]{27})^4 \rightarrow 3^4 = \boxed{81}$$

$$10) 8^{-2/3} \rightarrow \frac{1}{8^{2/3}} \rightarrow \frac{1}{(\sqrt[3]{8})^2} = \frac{1}{2^2} = \boxed{\frac{1}{4}}$$

$$11) 10^{4x+3} = 10^{2x+23} \quad a^m = a^n \rightarrow \boxed{m=n}$$

$$4x+3 = 2x+23$$

$$2x = 20$$

$$\boxed{x=10}$$

$$12) 3^x = 9^{x-2}$$

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

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

$$x = 2x - 4$$

$$4 = 1x$$

$$\boxed{x=4}$$

$$13) 25^{2x-4} = 125^{x+4}$$

$$\downarrow$$
$$\cancel{5}^{2(2x-4)} = \cancel{5}^{3(x+4)}$$

$$2(2x-4) = 3(x+4)$$

$$4x - 8 = 3x + 12$$

$$1x = 20$$

$$\boxed{x=20}$$