

HW 9-2

1. $8x^{18}y^9$

2. x^{3a+1}

3. $\frac{16x^6}{9y^4}$

4. 1000

5. $162y^8$

6. $\frac{3x}{16}$

7. $80b^{12}$

8. 3^6

9. 32

10. 400

11. $2^8 = 256$

Name _____ Alg 2 HW 9-2

Simplify each expression. No calculators!

$$1. (2x^6y^3)^3 = 2^3 x^{18} y^9 = 8x^{18}y^9$$

$$2. x^{2a} \cdot x^{a+1} = x^{2a+a+1} = x^{3a+1}$$

$$3. \left(\frac{4x^3}{3y^2}\right)^2 = \frac{4^2 x^6}{3^2 y^4} = \frac{16x^6}{9y^4}$$

$$4. 2^3 \cdot 5^3 = (2 \cdot 5)^3 = 10^3 = 1000$$

$$5. 2(3y^2)^4 = 2 \cdot (3^4 y^8) = 2 \cdot 81 y^8 = 162 y^8$$

$$6. \frac{3x^5}{(2x)^4} = \frac{3x^5}{16x^4} = \frac{3x}{16}$$

7. If $x = 5a^4$ and $a = 2b^3$ express x in terms of b .

$$x = 5(\underline{2b^3})^4 = 5 \cdot 16 b^{12} = 80 b^{12}$$

8. Express 9^3 as a power of 3.

$$9 = 3^2 \quad (3^2)^3 = 3^6$$

9. Divide 8^3 by 2^4

$$(2^3)^3 \div 2^4 = \frac{2^9}{2^4} = 2^5 = 32$$

10. Using the power rule evaluate 25 times 16.

$$5^2 \cdot 4^2 = (5 \cdot 4)^2 = 20^2 = 400$$

11. Use the powers of 2 to help you perform the calculation of $\frac{2^7 \cdot 2^5}{16}$

$$\frac{2^7 \cdot 2^5}{2^4} = \frac{2^{12}}{2^4} = 2^8 = 256$$

Negative and Fractional Exponents

Negative and Fractional Exponents

Unit 9 Day 3

Rule:

Negative Exponent →

$$\frac{x^{-1}}{1} = \frac{1}{x^1}$$

Reciprocals

① Move the part with the (-) exp.

② Make the exp (+)

$$x^{-n} = \frac{1}{x^n}$$

Examples:

a. $3^{-1} = \frac{1}{3^1} = \frac{1}{3}$

b. $2(3^{-1}) = \frac{2}{3^1} = \frac{2}{3}$

a. $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

b. $-5^{-2} = \frac{-1}{5^2} = \frac{-1}{25}$

$$\frac{1}{x^{-n}} = x^n$$

a. $\frac{1}{3^{-2}} = 3^2 = 9$

b. $\frac{3}{2^{-3}} = 3 \cdot 2^3 = 3 \cdot 8 = 24$

$$\left(\frac{x}{y}\right)^{-n} = \frac{x^{-n}}{y^{-n}} = \frac{y^n}{x^n} = \left(\frac{y}{x}\right)^n$$

a. $\left(\frac{2}{3}\right)^{-2} = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$

b. $\frac{x^{-5}}{y^{-6}} = \frac{y^6}{x^5}$

Simplify each expression leaving only positive exponents. Assume all variables are nonzero.

$$1. \frac{5^{-2}}{1} = \frac{1}{5^2} = \frac{1}{25}$$

$$3. \left(-\frac{3}{2}\right)^{-3} = \left(-\frac{2}{3}\right)^3 = \frac{-8}{27}$$

$$5. \frac{(3x)^{-3}}{1} = \frac{1}{(3x)^3} = \frac{1}{27x^3}$$

$$7. 2^{-5} \cdot 2^3 \cdot 2^4 = 2^{-5+3+4} = 2^2 = 4$$

or

$$\frac{2^3 \cdot 2^4}{2^5} = \frac{2^7}{2^5} = 2^2 = 4$$

$$2. \frac{(-2)^{-2}}{1} = \frac{1}{(-2)^2} = \frac{1}{4}$$

$$4. \frac{y^{-3}}{x^{-4}} = \frac{x^4}{y^3}$$

$$6. \frac{(4x)^{-3}}{3x^{-2}} = \frac{x^2}{(4x)^3(3)} = \frac{x^2}{64x^3(3)} = \frac{x^2}{192x^3} = \frac{1}{192x}$$

$$8. \left(\frac{3x^2}{2x^{-3}}\right)^{-2} = \left(\frac{3x^2 \cdot x^3}{2}\right)^{-2} = \left(\frac{3x^5}{2}\right)^{-2} = \left(\frac{2}{3x^5}\right)^2 = \frac{4}{9x^{10}}$$

Fractional Exponents →

Radicals

$$\sqrt[n]{x} = x^{1/n}$$

$$\sqrt{x} = x^{1/2}$$

$$\sqrt[3]{x} = x^{1/3}$$

$$\sqrt[n]{x} = x^{1/n}$$

$$9^{1/2} = \sqrt{9} = 3$$

$$8^{1/3} = \sqrt[3]{8} = 2$$

$$243^{1/5} = \sqrt[5]{243} = 3$$

Write using a radical sign:

9. $y^{\frac{1}{5}} = \sqrt[5]{y}$

10. $(3x)^{\frac{1}{4}} = \sqrt[4]{3x}$

Write using exponents:

11. $\sqrt[4]{2a} = (2a)^{\frac{1}{4}}$

12. $x\sqrt{y} = \cancel{(xy)^{\frac{1}{2}}} = xy^{\frac{1}{2}}$

Evaluate. (No calculators!)

$$13. \quad 81^{\frac{1}{4}} = \sqrt[4]{81} = 3$$

$$14. \quad 27^{\frac{1}{3}} = \sqrt[3]{27} = 3$$

$$15. \quad 100^{-\frac{1}{2}} = \frac{1}{100^{\frac{1}{2}}} = \frac{1}{\sqrt{100}} = \left(\frac{1}{10}\right)$$

$$16. \quad (-8)^{\frac{1}{3}} = \sqrt[3]{-8} = -2$$

$$17. (-27)^{-\frac{1}{3}} = \frac{1}{(-27)^{\frac{1}{3}}} = \frac{1}{\sqrt[3]{-27}} = \frac{1}{-3}$$

$$18. \left(\frac{4}{49}\right)^{\frac{1}{2}} = \sqrt{\frac{4}{49}} = \frac{2}{7}$$

$$19. \left(\frac{16}{25}\right)^{-\frac{1}{2}} = \left(\frac{25}{16}\right)^{\frac{1}{2}} = \sqrt{\frac{25}{16}} = \frac{5}{4}$$

20. Use the properties of exponents to rewrite the expression with positive exponents.

$$f(x) = \frac{9}{(2x)^{-3}} = 9(2x)^3 = 9(8x^3) = 72x^3$$

Find the value of $f\left(-\frac{1}{3}\right)$ $72\left(-\frac{1}{3}\right)^3 = 72\left(-\frac{1}{27}\right) = \frac{-72}{27} = \left(-\frac{8}{3}\right)$

$$= \frac{9}{\left(2\left(-\frac{1}{3}\right)\right)^{-3}} = \frac{9}{\left(-\frac{2}{3}\right)^{-3}} = \frac{9}{\left(-\frac{3}{2}\right)^3} \text{ yuck}$$

or $9\left(-\frac{2}{3}\right)^3 = 9\left(\frac{-8}{27}\right) = \frac{-72}{27} = -\frac{8}{3}$

Do you recall how to add, subtract and multiply fractions?

$$\frac{1}{5} + \frac{2}{5} = \underline{\hspace{2cm}}$$

$$\frac{2}{3} + \frac{3}{4} = \underline{\hspace{2cm}}$$

$$\frac{6}{7} - \frac{1}{2} = \underline{\hspace{2cm}}$$

$$\frac{5}{9} - \frac{1}{3} = \underline{\hspace{2cm}}$$

$$3 \cdot \frac{2}{5} = \underline{\hspace{2cm}}$$

$$\frac{3}{8} \cdot 4 = \underline{\hspace{2cm}}$$

use Calc!

21. Use the properties of exponents to evaluate the following expressions

a. $3^{\frac{1}{2}} \cdot 3^{\frac{1}{8}}$

$$3^{\frac{1}{2} + \frac{1}{8}} = 3^{\frac{5}{8}}$$

b. $\frac{5^3}{5^{\frac{1}{6}}}$

$$5^{3 - \frac{1}{6}} = 5^{\frac{17}{6}}$$

c. $\left(7^{\frac{1}{6}}\right)^6$

$$7^{\frac{1}{6} \cdot 6} = 7^1 = 7$$

NORMAL FLOAT AUTO REAL Radian MP

1/2+1/8

Ans>Frac

0.625

Ans>Frac

5/8

NORMAL FLOAT AUTO REAL Radian MP

1/3-1/6

Ans>Frac

0.1666666667

1/6*6

Ans>Frac

1

Quiz Friday
up through (-) Exp.
(No fractional Exp)