Day 3: Exponents

Date_____

Review: Properties of Exponents

1) $x^0 =$ 1

2) $x^{-m} =$ $\frac{1}{x^m}$

3) $\frac{1}{x^{-m}} =$ $\frac{x^m}{1} = x^m$

4) $x^m x^n =$ x^{m+n}

5) $\frac{x^m}{x^n} =$ x^{m-n} $x^m x^{-n}$

6) $(x^m)^n =$ $x^{m \cdot n}$

7) $\sqrt[n]{x^m} =$ $x^{\frac{m}{n}}$

8) $x^{\frac{m}{n}} =$ $(\sqrt[n]{x})^m$

What if...?

9) What if there is a coefficient with our variable(s)?
*What is a coefficient? a number in front of a letter

$3x$ $\frac{1}{2}b$ $0.54x$ different base

10) $2x^0$ $2 \cdot x^0$ $2 \cdot 1 = 2$

11) $(3x)^0$ $= 3^0 \cdot x^0$ $= 1 \cdot 1 = 1$

12) $2y^{-5}$ $= 2 \cdot y^{-5}$ $= 2 \cdot \frac{1}{y^5} = \frac{2}{y^5}$

13) $(3y)^{-2}$ $= 3^{-2} \cdot y^{-2}$ $= \frac{1}{3^2 \cdot y^2} \cdot \frac{1}{(3y)^2}$

14) $2x^3 \cdot 5x = 2 \cdot 5 \cdot x^3 \cdot x$ $2 \cdot x^3 \cdot 5 \cdot x = 10x^4$

15) $\frac{3x}{6x^2} = \frac{3}{6} \cdot \frac{x^1}{x^2} = \frac{1}{2} \cdot \frac{1}{x} = \frac{1}{2x}$

16) $\frac{5x}{3y^{-2}} = \frac{5}{3} \cdot \frac{x}{y^{-2}} = \frac{5}{3} xy^2$

17) $\frac{12x}{6x \cdot 2y^{-2}} = \frac{12}{6 \cdot 2} \cdot \frac{x}{x} \cdot \frac{1}{y^{-2}}$ $= y^2$

Simplify. Your answer should contain only positive exponents.

18) aa^2 $= a^3$

19) $a \cdot 3a^{-2}$ $= 3 \cdot a \cdot a^{-2}$
$= 3a^{-1}$
$= \frac{3}{a}$

20) $n^{\frac{1}{4}} \cdot 2n^{\frac{5}{3}}$ $= 2 \cdot n^{\frac{1}{4}} \cdot n^{5/3}$
$= 2 \cdot n^{3/12} \cdot n^{\frac{20}{12}}$
$= 2n^{\frac{23}{12}}$

21) $3x^{-\frac{3}{4}} \cdot x^{\frac{5}{4}} \cdot 2x^{-\frac{7}{4}}$ $= 3 \cdot 2 \, x^{-\frac{3}{4}} \cdot x^{\frac{5}{4}} \cdot x^{-\frac{7}{4}}$
$= 6x^{-\frac{5}{4}}$
$= \frac{6}{x^{\frac{5}{4}}}$

22) $(2x^2)^{-2}$ $= 2^{-2} \cdot x^{-4}$
$= \frac{1}{4x^4}$

23) $(4x^4)^{-2}$ $= 4^{-2}x^{-8}$
$= \frac{1}{16x^8}$

24) $(x^{-1})^{\frac{1}{4}}$ $= x^{-\frac{1}{4}}$
$= \frac{1}{x^{1/4}}$

25) $\left(n^{\frac{3}{4}}\right)^{\frac{4}{3}}$ $= n^{\frac{12}{12}} = n$

26) $\frac{n}{2n^2}$ $= \frac{1}{2n^2n^{-1}} = \frac{1}{2n}$

27) $\frac{3x^{-2}}{x^{-3}}$ $= 3x^{-2}x^3$
$= 3x$

28) $\frac{3x^{-\frac{1}{3}}}{4x^{-\frac{1}{3}}}$ $= \frac{3}{4} \cdot \frac{x^{-\frac{1}{3}}}{x^{-1/3}} = \frac{3}{4}$

29) $\frac{2x}{4x^2}$ $= \frac{2}{4} \cdot \frac{x}{x^2}$
$= \frac{1}{2} \cdot \frac{1}{x^2x^{-1}} = \frac{1}{2x}$

30) $\dfrac{\left(b^{\frac{1}{2}}\right)^{\frac{1}{3}}}{b^{\frac{3}{4}}b^{0}} = \dfrac{b^{\frac{1}{6}}}{b^{3/4}}$

$= \dfrac{1}{b^{\frac{9}{12}}b^{\frac{3}{12}}} = \dfrac{1}{b^{\frac{11}{12}}}$

31) $\left(\dfrac{6a^{\frac{3}{4}}a^{\frac{2}{4}}}{2a^{\frac{5}{4}}}\right)^{\frac{1}{3}} = \left(\dfrac{6}{2}\cdot\dfrac{a^{\frac{5}{4}}}{a^{\frac{5}{4}}}\right)^{\frac{1}{3}} = 3^{\frac{1}{3}}$

32) $\dfrac{n^{-2}\cdot(5n)^{-1}}{\left(n^{\frac{7}{4}}\right)^{-\frac{1}{2}}} = \dfrac{5^{-1}n^{-2}n^{-1}}{n^{-\frac{7}{8}}}$

$= 5^{-1}\cdot n^{-3}\cdot n^{\frac{7}{8}}$

$= 5^{-1}n^{-\frac{24}{8}}n^{\frac{7}{8}}$

$= 5^{-1}n^{-\frac{17}{8}} = \dfrac{1}{5n^{\frac{17}{8}}}$

33) $\dfrac{\left(n^{-\frac{3}{2}}\right)^{\frac{4}{3}}\cdot 12n^{\frac{2}{3}\cdot 2}}{4n^{-\frac{1}{2}}} = \dfrac{12}{4}\cdot\dfrac{n^{-\frac{12}{6}}n^{\frac{4}{6}}}{n^{-1/2}}$

$= 3\cdot\dfrac{n^{-\frac{8}{6}}}{n^{-1/2}} = 3\dfrac{n^{-\frac{8}{6}}}{n^{-3/6}}$

$= 3\dfrac{1}{n^{-3/6}n^{8/6}} = 3\dfrac{1}{n^{5/6}}$

34) $\dfrac{\left(6p^{-\frac{1}{2}}\right)^{-1}}{p^{-\frac{3}{4}}p^{\frac{1}{4}}p^{\frac{8}{4}}} = \dfrac{6^{-1}p^{\frac{1}{2}}}{p^{\frac{6}{4}}}$

$= \dfrac{1}{6p^{\frac{3}{2}}p^{-\frac{1}{2}}} = \dfrac{1}{6p}$

35) $\dfrac{2^2\cdot 2x}{2^1\cdot x^2\cdot\left(x^{-\frac{4}{3}}\right)^{-\frac{4}{3}}} = \dfrac{2\cdot 2}{1}\cdot\dfrac{x}{x^2x^{\frac{16}{9}}}$

$= 4\cdot\dfrac{1}{x^{\frac{18}{9}}x^{\frac{16}{9}}x^{\frac{9}{9}}}$

$= 4\cdot\dfrac{1}{x^{\frac{25}{9}}}$

36) $\left(\dfrac{\left(3m^{\frac{5}{3}}m^{-\frac{3}{2}}\right)^{-2}}{m^{\frac{1}{4}}}\right)^{\frac{3}{2}} = \left(\left(\dfrac{3m^{\frac{10}{6}}m^{-\frac{9}{6}}}{m^{1/4}}\right)^{-2}\right)^{3/2}$

$= \left(\left(\dfrac{3m^{1/6}}{m^{1/4}}\right)^{-2}\right)^{3/2} = \left(\left(3m^{3/2}m^{-3/2}\right)^{-2}\right)^{3/2}$

$= \left(\left(3m^{-1/6}\right)^{-2}\right)^{3/2} = \left(3^{-2}m^{1/6}\right)^{3/2} = 3^{-3}m^{1/4}$

37) $\dfrac{a^2a^{\frac{7}{4}}}{\left(8a^{-\frac{1}{4}}\right)^{-1}}$

