

## 4.2 Negative Exponents

A. **For any real number:**  $a^{-n} = \frac{1}{a^n}$  [Note that base “crossing” the fraction bar changes sign of exponent ONLY.]

Examples:  $3^{-1} = \frac{1}{3^1} = \frac{1}{3}$

$4^{-2} = \frac{1}{4^2} = \frac{1}{16}$

$9^{-2} = \underline{\hspace{2cm}}$        $10^{-1} = \underline{\hspace{2cm}}$

$(-5)^{-3} = \frac{1}{(-5)^3} = \frac{1}{-125} = -\frac{1}{125}$

$-3^{-2}$  means  $-(3^{-2}) = -\frac{1}{3^2} = -\frac{1}{9}$        $(-4)^{-1} = \underline{\hspace{2cm}}$        $x^{-6} = \underline{\hspace{2cm}}$

Express in an equivalent form with **no negative exponents**. Simplify if possible.

1.  $4^{-1} = \underline{\hspace{2cm}}$

2.  $2^{-3} = \underline{\hspace{2cm}}$

3.  $(-5)^2 = \underline{\hspace{2cm}}$

4.  $-5^2 = \underline{\hspace{2cm}}$

5.  $y^{-2} = \underline{\hspace{2cm}}$

6.  $3^{-2} = \underline{\hspace{2cm}}$

7.  $(-3)^{-2} = \underline{\hspace{2cm}}$

8.  $4^{-2} = \underline{\hspace{2cm}}$

9.  $m^{-1} = \underline{\hspace{2cm}}$

B. **For any real number:**  $\frac{1}{a^{-n}} = a^n$  [Note that the base “crossing” the fraction bar changes the sign of the exponent ONLY.]

**EX:**  $\frac{1}{y^{-4}} = y^4$        $\frac{1}{4^{-2}} = 4^2 = 16$        $\frac{1}{x^{-5}} = \underline{\hspace{2cm}}$        $\frac{1}{6^{-1}} = \underline{\hspace{2cm}}$

10.  $\frac{1}{a^{-3}} = \underline{\hspace{2cm}}$

11.  $\frac{1}{x^{-5}} = \underline{\hspace{2cm}}$

12.  $\frac{1}{2^{-3}} = \underline{\hspace{2cm}}$

13.  $xy^{-3} = \underline{\hspace{2cm}}$

14.  $(xy)^{-3} = \underline{\hspace{2cm}}$

15.  $5m^{-4} = \underline{\hspace{2cm}}$

16.  $a^{-5}b^3 = \underline{\hspace{2cm}}$

17.  $\frac{2}{x^{-4}} = \underline{\hspace{2cm}}$

18.  $\frac{7}{n^{-9}} = \underline{\hspace{2cm}}$

C. **For any real number:**  $\left(\frac{\Delta}{X}\right)^{-\text{exp.}} = \left(\frac{X}{\Delta}\right)^{+\text{exp.}}$       Ex.  $\left(\frac{3}{x}\right)^{-2} = \underline{\hspace{2cm}}$        $\left(\frac{m}{5}\right)^{-3} = \underline{\hspace{2cm}}$

19.  $\left(\frac{W}{X}\right)^{-3} = \underline{\hspace{2cm}}$

20.  $\left(\frac{4}{m}\right)^{-2} = \underline{\hspace{2cm}}$

21.  $\left(\frac{4}{5}\right)^{-2} = \underline{\hspace{2cm}}$

Simplify each expression using exponent rules. Answers cannot contain negative exponents.

22.  $x^3x^{-5} =$  \_\_\_\_\_

23.  $y^{-7}y^3 =$  \_\_\_\_\_

24.  $m^{-3}m^{-12} =$  \_\_\_\_\_

25.  $\frac{x^6}{x^{-3}} =$  \_\_\_\_\_

26.  $\frac{y^{-3}}{y^8} =$  \_\_\_\_\_

27.  $\frac{m^{-4}}{m^{-6}} =$  \_\_\_\_\_

28.  $(x^{-2})^{-6} =$  \_\_\_\_\_

29.  $(a^{-3})^2 =$  \_\_\_\_\_

30.  $(m^4)^{-3} =$  \_\_\_\_\_

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

32.  $\left(\frac{7}{y^{-2}}\right)^{-1} =$  \_\_\_\_\_

33.  $\left(\frac{v^{-5}}{m^{-6}}\right)^{-2} =$  \_\_\_\_\_

34.  $(2x^3y^{-4})^3 =$  \_\_\_\_\_

35.  $(4x^{-2}y^5)^{-2} =$  \_\_\_\_\_

36.  $(5x^8y^{-3})^{-1} =$  \_\_\_\_\_

37.  $\frac{7x^{-3}}{m^{-2}y^4} =$  \_\_\_\_\_

38.  $\frac{5m^{-2}}{b^5k^{-4}} =$  \_\_\_\_\_

39.  $\frac{-7a^{-1}}{r^{-3}s^{-6}} =$  \_\_\_\_\_