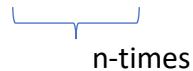


**MATH 7 HOMEWORK 3: Algebraic operations continued**  
September 29, 2024

### 1. Exponents Laws

If  $a$  is a real number,  $n$  is a positive integer

$$a^n = a \times a \times \cdots \times a$$

  
n-times

$$a^0 = 1$$

$$a^m \times a^n = a^{m+n}$$

$$a^m \div a^n = a^{m-n}$$

$$(ab)^n = a^n b^n$$

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

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

$$(a^m)^n = a^{mn}$$

### 2. Radicals

$$\begin{aligned} a^{\frac{m}{n}} &= \sqrt[n]{a^m} \\ \sqrt{ab} &= \sqrt{a}\sqrt{b} \end{aligned}$$

### 3. Main Algebraic Identities

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$a^2 - b^2 = (a - b)(a + b)$$

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1. Simplify:

a)  $\frac{1}{(x+1)} - \frac{1}{(x-1)}$

b)  $\left(1 + \frac{1}{x}\right) \div (x+1)$

c)  $\left(1 + \frac{1}{x}\right) \div \left(1 - \frac{1}{x}\right)$

2. Simplify, use powers for radicals

a.  $\sqrt{\frac{56}{13}} \cdot \sqrt{\frac{26}{7}} =$

b.  $\sqrt[3]{\frac{56}{13}} \sqrt[3]{\frac{26}{7}} =$

c.  $\sqrt{48} =$

d.  $\sqrt[4]{48}$

e.  $\frac{\sqrt{48}}{\sqrt{15}} =$

f.  $\sqrt[3]{a^2 b^3 c^4 d^5}$

g.  $\sqrt[4]{a^2 b^3 c^4 d^5}$

h.  $\sqrt[5]{a^2 b^3 c^4 d^5}$

3. Express the following expressions in the form  $2^r 3^s a^m b^n$ :

a.  $8a^3 b^2 (27a^3)(2^5 ab) =$

b.  $3^2 (2ab)^3 (16a^2 b^5)(24b^2 a) =$

c.  $16a^2 b^3 (6ab^4)(ab^2)^3 =$

4. Expand as sums of powers of  $x$ :

a.  $(2x+5)^2 =$

b.  $(2-4x)^2 =$

c.  $(1-2x)^2 =$

5. Factor (i.e., write as a product) the following expressions:

a.  $4x^2 + 8xy + 4y^2$

d.  $256 - a^8 b^8$

b.  $9x^2 - 25$

e.  $3x^3 - x^2 y + 6x^2 y - 2xy^2 + 3xy^2 - y^3$

c.  $(x-2)^2 - (y+3)^2$

f.  $x^4 + 4$  Hint: add and subtract  $4x^2$

6. Solve the following equations:

a.  $5(x+1) = 3x+2$

d.  $(x-3)(x+4) = 0$

b.  $(x^2 - 1)(x+2) = 0$

e.  $x^2 + 4x = 0$

c.  $\frac{x+2}{x+3} = 2$

f.  $x^3 + 4x = 0$

7. Prove:

a.  $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

b.  $(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

c. Find  $(a+b)^4, (a-b)^4$  using the previous results